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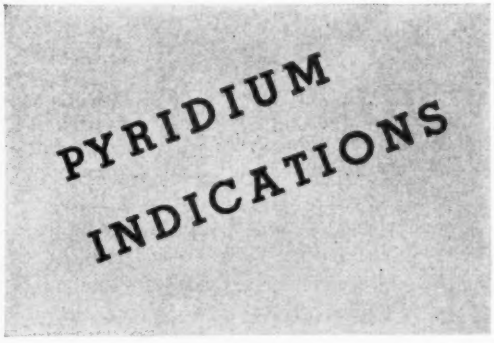

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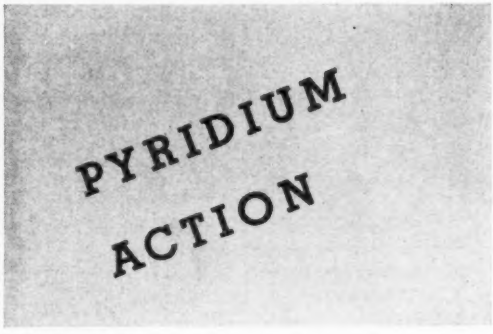

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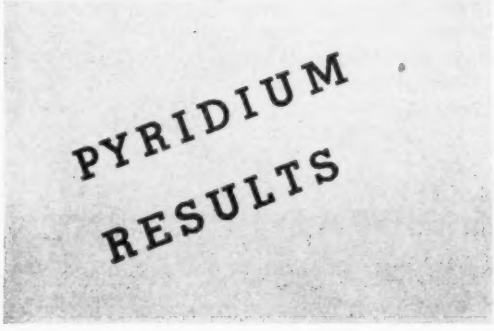

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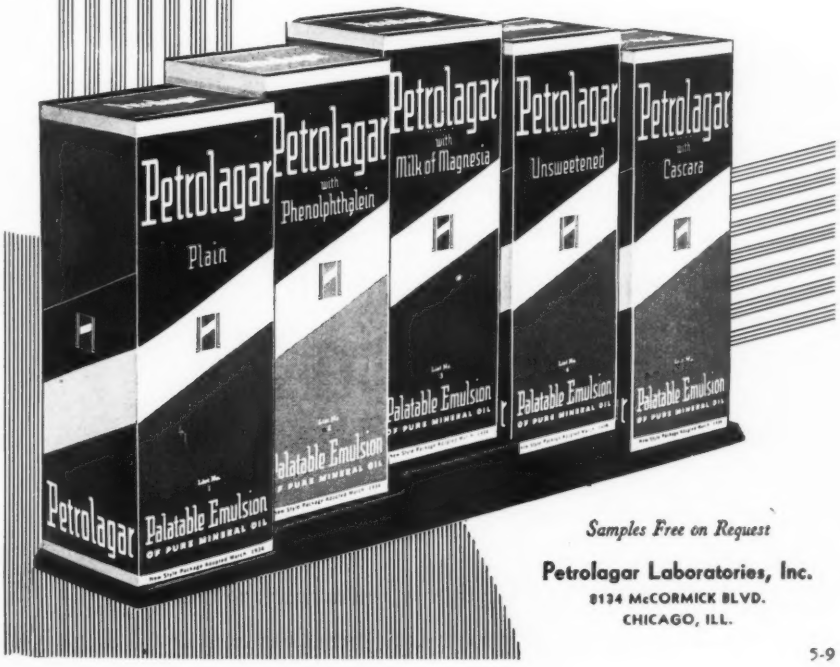

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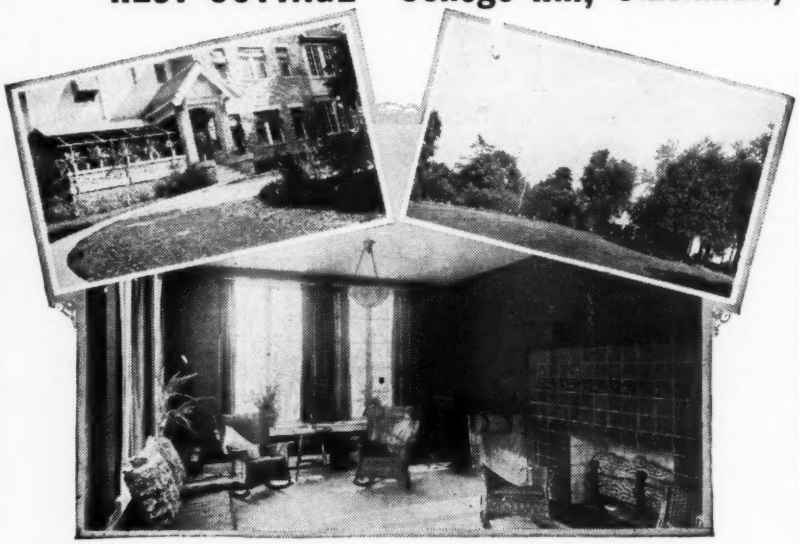

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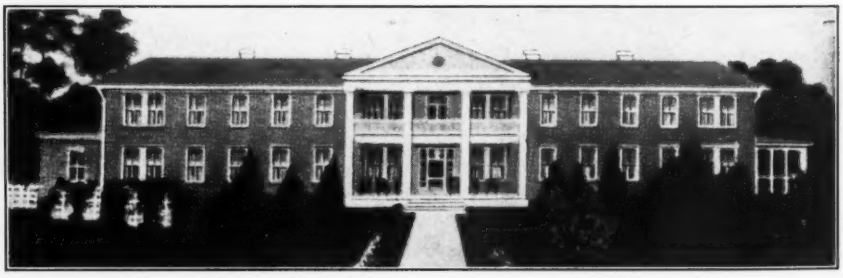

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SURGICAL AND RADIATION TREATMENT OF GASTRIC CANCER*

By GEORGE T. PACK, M.D.,
New York, New York

The stomach is the most frequent site of cancer in males and occupies third place in frequency in females, being exceeded in this sex only by cancers of the breast and uterus. Although it contributes at least 35 per cent of all cancer deaths, yet scarcely more than 2 per cent of gastric cancers are salvaged by early and appropriate treatment. This is a sad commentary on the ability of the medical profession at large to diagnose early cancer of the stomach. The insidious onset of the disease, the lack of specific diagnostic signs and symptoms and the general prevalence of chronic indigestion in persons of middle age account in part for the fact that most gastric cancers are inoperable at the time the diagnosis is established.

Our knowledge of the prevention of gastric cancer is more theoretical than practical. We have corroborated the observations of Schmidt, who found gastric cancer occurring in two distinct body types: one, a poorly developed, adynamic, asthenic, anemic subject with phthisical habitus, visceroptosis, sparse growth of body hair, who suffers from epistaxis and chronic dyspepsia from childhood, often developing gastric cancer early in life; the other, a robust, dynamic hypersthenic subject with viscera lying transversely, with high pilosity, who eats enormous quantities of food at any and all hours, the so-called gastric athlete who digs his grave with his teeth and often develops gastric cancer late in life. Craver conducted a thorough etiological survey of patients with gastric cancer at this hospital and concluded that such factors as poor teeth, edentation, heat of ingested food and drink, irregularity of meals, lack of water, seasoning, cathartics, rapid eating with improper mastication, tobacco and alcohol in the order named, played a significant role in the development of this disease.

There are three definite precancerous conditions which occur in the stomach and against which we may direct our efforts in the prevention of gastric cancer. Chronic gastritis with its attendant achylia gastrica may precede the development of cancer. The incidence of cancer in patients with persistent achlorhydria is notably higher than in other patients of the same age groups. We treat these patients by the daily administration of large quantities of dilute hydrochloric acid and a diet rich in vitamins A and G. The second precancerous lesion is gastric polyposis, which may occur as single or multiple polyps, either the predunculated variety or the flat "en nappe" type with giant hypertrophied rugae. The last two cases which we have seen at the Memorial Hospital had surgical interference for polyps which were presumably benign, but in both instances were found to have undergone malignant transformation.

It is not our purpose to engage in the controversy concerning the frequency of the development of cancer in chronic gastric ulcers. Authorities differ as to the incidence of this complication, but they are almost uniform in admitting its possibility. It is difficult at times to distinguish between a cancer developing on a pre-existing gastric ulcer and a cancer which is secondarily ulcerated; there are histological criteria which solve this problem, but this is accomplished only after treatment has been carried out. The failure of any gastric ulcer to respond to appropriate medical treatment as judged by an abatement of symptoms and subsequent roentgenographic studies is sufficient indication for a laparotomy and surgical removal of the ulcer. I recall one specimen in which

*Read in General Clinical Session, Southern Medical Association, Twenty-Seventh Annual Meeting, Richmond, Virginia, November 14-17, 1933.

*From Memorial Hospital for the Treatment of Cancer and Allied Diseases.

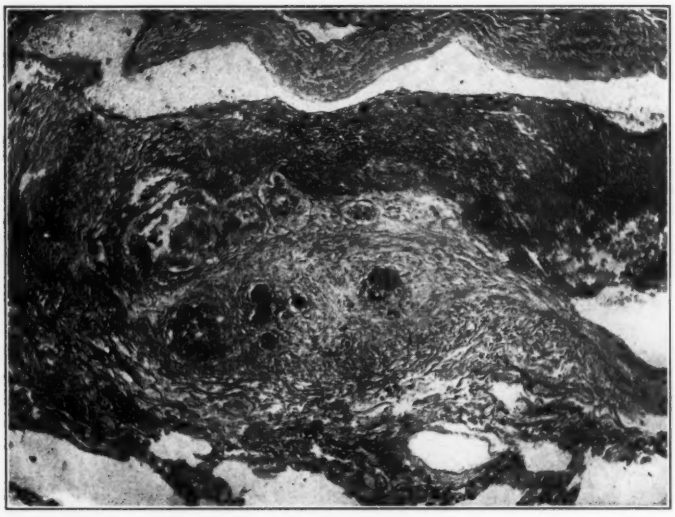

Fig. 1

Cancer cells in vasa vasorum of large vessel in lung causing thrombosis. Bacterial emboli from the infected gastric cancer accompanied the cancer cells and caused numerous bronchopneumonic foci. An unavoidable cause of immediate postoperative death.

three separate ulcers 2.5 to 3 cm. in diameter with well defined margins and clean bases and occurring concentrically around the antrum were diagnosed grossly by the pathologist as benign; all three lesions in this specimen were ulcerating cancers as revealed by later microscopical study.

Although there is much room for improvement in the early diagnosis of gastric cancer, yet there will always be numerous cases which must be classified as inoperable at the time the patient experiences the first symptom or sign of the disease. I shall cite a few specific instances.

A young woman with unimpaired digestion had been treated for an umbilical tumor for four months before admission to the Memorial Hospital, where the primary lesion was identified as a gastric cancer. A vigorous laborer found it necessary to let out his belt, notch by notch, due to an asymptomatic enlargement of his abdomen, which was found to be caused by ascites secondary to an inoperable gastric cancer. A professional parachute jumper, in apparent splendid health, experienced a profuse gastric hemorrhage immediately after a parachute descent. He attributed this incident to his occupation, but roentgenograms revealed a carcinoma of the stomach. A middle-aged man had diffuse metastases involving bone for which a primary site could not be ascertained from the patient's history; a routine gastrointestinal x-ray study revealed the presence of an unsuspected cancer of the stomach. Another middle-aged man had symptoms referable to his stomach for only ten days prior to examination, but at this time had well developed pulmonary metastases from the primary gastric cancer. Still another patient had gastric symptoms of only nine days' duration, ending in sudden pyloric obstruction; at operation, an inoperable cancer was found occupying the distal two-thirds of the organ. A seventy-year-old male complained of substernal pain radiating down the left arm, which was diagnosed as angina pectoris by an eminent cardiologist, but six months later was found to be due to a cancer involving the cardiac orifice of the stomach. Numerous patients have applied to the admitting office of the Memorial Hospital for treatment of a lump in the left neck which proved to be the signal nodes of Troisier or Virchow containing metastatic cancer from unheralded gastric cancers. Last month I performed a partial gastrectomy for cancer on a fifty-three-year-old male patient. One week later his fifty-six-year-old brother, who was in excellent health, stated that since his brother's operation he first became conscious of having a stomach, although his appetite was good and he had not lost weight. Roentgenograms of his stomach showed a cancer involving the pylorus and antrum, similar in distribution to his brother's. This patient also had a partial gastrectomy two weeks after his brother's operation; both recovered with good prognostic outlooks. It seems logical to assume that this patient would never have had a diagnostic survey sufficiently early to recognize his gastric cancer in an operable stage if his brother had not undergone his recent experience.

Partial gastrectomy is the method of choice in the treatment of gastric cancer. It is limited to cancers involving the distal half of the stomach, where fortunately the majority of gastric

cancers are situated. We employ subtotal gastric resection not only as an attempted curative measure for cancers classified as operable, but occasionally for palliation in cases classified as inoperable because of visceral or distant metastasis. Modifications of the Billroth I operation are seldom used, as it is our belief that in anticipation of the end-to-end anastomosis of the duodenum and the proximal segment of the stomach, a surgeon may not be sufficiently radical in his resection; furthermore, recurrences after this operation quickly occlude the new stoma. The type of resection and the method of anastomosis must depend more or less on local conditions and the surgeon must adapt his surgical procedures accordingly. The Billroth II operation with a posterior gastrojejunostomy or an anterior gastrojejunostomy with lateral anastomosis of the ascending and descending loops, in the event that the proximal gastric stump is too high to effect the former procedure, are methods commonly employed, although we also find use for the posterior Polya and anterior Balfour end-to-side gastrojejunal anastomoses.

The von Petz sewing clamp facilitates the speed of this operation and finds its greatest usefulness in the Billroth II operation. This clamp contains two parallel rows of tiny silver clips, which are placed across the stomach well above the margins of the tumor, by the simple application of the clamp. A quick incision between the two rows severs the stomach, after which a continuous sero-muscular suture is sufficient to close the proximal stump. These clips form a hemostatic and waterproof closure. The same procedure may be used for the severance of the duodenum. The clips are left permanently in place and the majority of them will later slough into the lumen of the stomach or duodenum.

The majority of operable cancers situated in the distal half of the stomach can be removed safely by a one-stage resection. Some operable gastric cancers occur in elderly patients who may also be poor operative risks because of prolonged pyloric obstruction with its consequent starvation, dehydration and chronic sepsis. When partial pyloric obstruction becomes complete and acute, an emergency arises which needs prompt surgical interference. At such a time the surgeon must weigh carefully his estimate of the patient's strength against the severity of the operation which he contemplates. It seems best under such circumstances to relieve the immediate danger of continued pyloric obstruction by quickly performing a gastro-enterostomy, reserving the partial resection for cancer to be done at a later date. We have never considered the two-stage resection to be practical for any gastric cancer unless pyloric obstruction is a predominant feature of the case. At the time the second step is planned the water balance of the body is normal, the mineral content of the blood and tissues is restored, the glycogen reserve of the liver and muscles is re-established and the patient is a more normally functioning organism. The greater safety of the two-stage operation for gastric cancer in the type of patient mentioned above is apparent in the lower mortality rate. The same may be said for operations on the colon where resection in two stages is generally accepted as the safe and proper method. The time of from ten to four-

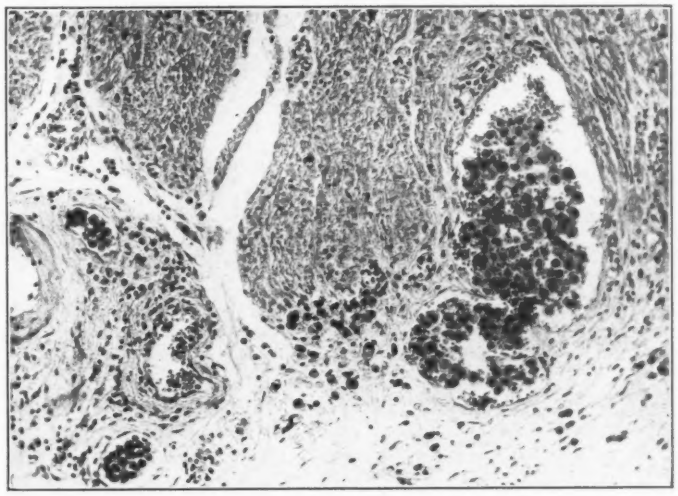

Fig. 2

A clinically operable carcinoma of the stomach, classified histologically as a medullary carcinoma, Grade III. This microphotograph shows lymphatics and veins in the subserosal layer, plugged with tumor cell emboli, although no regional or distant metastases were found at the time of operation.

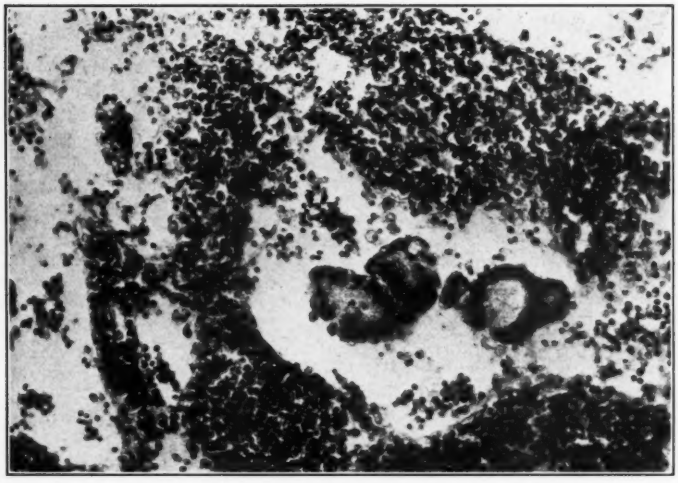

Fig. 3

Embolic clusters of carcinoma cells in lymph sinus of perigastric node of normal size. This illustrates the necessity of radical excision of the lymph node bearing tissues adjacent to the carcinoma.

teen days elapsing between the two operations insures the establishment of good function in the gastro-enterostomy stoma and in the re-establishment of the gastro-intestinal gradient or flow of contents. This functional adaptation is important as it prevents dilatation of the duodenum and diminishes the risk of perforation of the duodenal stump after the partial gastrectomy has been done.

Although total gastrectomy is attended by a very high operative mortality, it should be employed more frequently if it is technically possible and if the patient's condition is good enough to tolerate such a formidable procedure. It should be remembered that in approximately 15 to 20 per cent of the postmortem examinations for gastric cancer, the tumor remains confined within the limits of the stomach. The operation is indicated for the diffuse fibrocarcinomas, linitis plastica, cancers extending high along the lesser curvature, cancers situated in the fundus and in the cardia. Invasion of the esophagus contraindicates total gastrectomy. This operation is performed more readily when the abdominal esophagus is long and uninvolved. Resection of the left costal arch after the method described by Baudet and Novarro facilitates the exposure of the esophageal stump, which is so necessary for resection and proper anastomosis. After the total gastrectomy, the esophagus is anastomosed end-to-side with a loop of jejunum, the ascending and descending loops of which are united by a lateral entero-enterostomy. In one case in which I was able to mobilize the duodenum and do an esophagojejunostomy, a small perforation occurred with a resultant duodenal fistula which persisted for two months. These accidents are best avoided by doing a Witzel or Marwedel jejunostomy for temporary feeding rather than by relying on the passage of the Levine tube through the anastomosis. After total gastrectomy the patient may receive as much as 50 c. c. of dilute hydrochloric acid daily.

It has been said that a gastro-enterostomy for cancer enables the patient to live longer and suffer more. This operation, employed for stenosing pyloric and antral cancers, is accompanied by an operative mortality almost as great as for partial gastrectomy. Although relieved of immediate obstruction, the patient continues to experience nausea, pain, eructation of gas and foul liquids, persistent hemorrhage and progressive anemia, to say nothing of the subsequent obstruction of the gastro-enterostomy stoma by extension of the cancer. We have attempted to overcome these handicaps by performing a gastro-enterostomy together with an exclusion of the pyloric or antral cancer. This is accomplished by a simple severance of the stomach proximal to the cancer with inversion of the wound edges and an immediate gastro-enterostomy, using either the posterior or anterior route. Although this operation does not remove the inoperable carcinoma, it excludes it from the gastro-intestinal circuit so that it does not contaminate the food and there is no danger of its extension to involve the new stoma. Furthermore, infection of the cancer subsides and there is less hemorrhage. The patient regains his appetite and experiences a sensation of well being and good digestion which seldom occurs with a simple gastro-enterostomy. The excluded cancerous segment is then suitable for palliative irradiation either from external sources or by the implantation of gold radon seeds.

There have been many handicaps in the successful application of radium and x-rays in the treatment of gastric cancer. The majority of cancers of the stomach are radio-resistant, less than 10 per cent exhibiting clinical improvement and radiographic evidence of regression following moderate exposure to external irradiation. The inaccessibility of the organ is deterrent to interstitial radium therapy unless a laparotomy be done. The stomach is in such close proximity to the liver, spleen, pancreas and suprarenal glands, all these organs being labile and sensitive to radiation, that heavy x-ray therapy is frequently accompanied by prolonged and severe radiation sickness. The stomach is necessarily in daily use and on this account is less tolerant to the effects of radiation than such organs as the uterus, breast, skin and lip. The gastric cancers selected for radiation therapy are only those which are inoperable either because of the extent of the disease or the region involved, for example, the fundus and cardia.

It has been our experience that the most radiosensitive gastric cancers are situated in the cardia and fundus, therefore there has been little conflict in our decision to employ radium and x-rays in lieu of surgery for these cancers. The percentage of cancers occurring in the cardia is reported in most statistics between 8 and 10, but at the Memorial Hospital 20 per cent of the gastric cancers have this regional localization chiefly because it is a cancer institute and receives many patients that are deemed inoperable in general hospitals. The ulcero-cancer is frequently radiosensitive and we have been able to obtain astonishing regression and palliation in histologically verified cases by intensive external irradiation. Polypoid and papillary cancers, many of which are bulky and have poor blood supply, respond well to irradiation, probably due to obliterative vascular changes in the supporting stroma. Ewing has observed that the small cell cancers originating from the base of the gastric glands constitute a radiosensitive group. There is a certain anaplastic small cell gastric cancer which bears a close morphological resemblance to lymphosarcoma and is extraordinarily sensitive to radiation. One of our patients with an inoperable carcinoma of this type from which a biopsy was obtained is now living and well five years after treatment by the radium element pack.

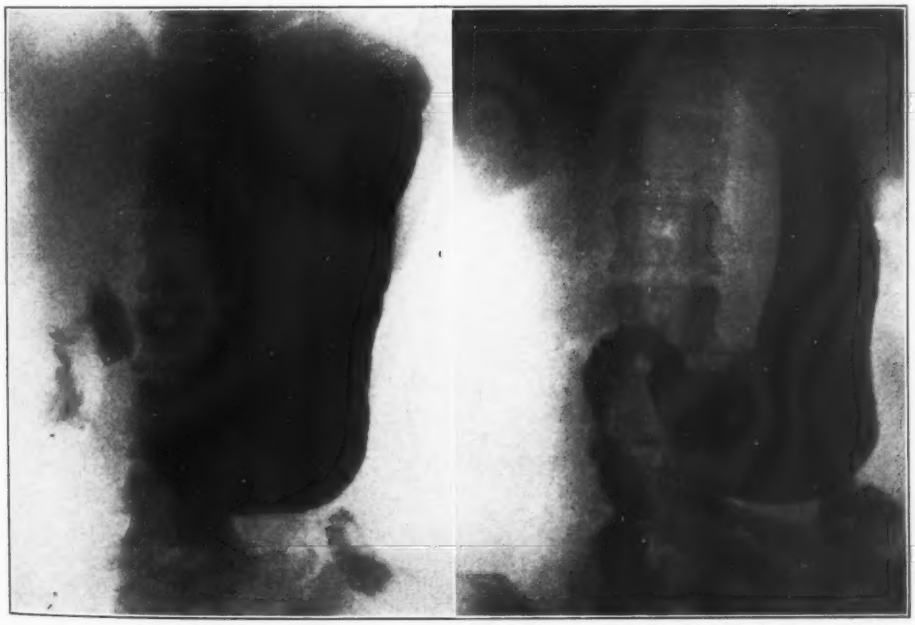

Fig. 4

Left: Roentgenogram of stomach in May, 1927, showing the presence of a bulky carcinoma involving the pylorus and antrum. Right: Roentgenogram of the same stomach in April, 1934, seven years after partial gastrectomy and a Billroth I anastomosis.

Fig. 5

Left: Annular carcinoma involving pars media and fundus of stomach.
Right: Same patient seven weeks after a total gastrectomy and direct anastomosis of abdominal esophagus to duodenum. Small fistula persists between anastomosis and abdominal wound. Note compensatory dilatation of duodenum.

It has been the practice at the Memorial Hospital whenever a combination of external and interstitial irradiation is contemplated to have the external irradiation precede the implantation of gold radon seeds. This procedure is reversed in the treatment of gastric cancer, because the external irradiation damages the abdominal skin so severely that wound healing is markedly impaired when a laparotomy is done for the insertion of radium in the stomach.

Cancers of the cardia are diagnosed by fluoroscopy and radiography followed by gastroscopy and biopsy whenever possible. The cardia is exposed by an incision running parallel to the left costal margin, severing the muscles and extending to the xiphoid cartilage. The skin is dissected widely upward and the ribs and cartilages of the costochondral junction are either resected completely or a hinged flap is made to be turned up for better exposure of the cardia. The procedure known as the Baudet-Novarro technic can be followed by resuturing the flap in place by the use of kangaroo tendon. The cancer is grasped within the left hand and hollow trocar needles each loaded with a gold radon seed are inserted diagonally throughout the tumor. We have given as high as 50 millicuries of radon interstitially by this procedure. There have been only two accidents in patients so treated, one a gastrocolic fistula resulting in death and another a gastric hemorrhage from which the patient recovered. There have been no instances of leakage and peritonitis. The dosage of radon given in this manner is based on a carefully computed scale which we have worked out for the treatment of cancers of the mouth and breast at the Memorial Hospital.

The operative procedure is completed by performing a Janeway gastrostomy, which is a tubed pedicled flap made from the anterior wall of the stomach and lined by gastric mucosa. This gastrostomy is permanent. The advantages offered are several, namely: to feed the patient when the cancer occludes the cardia and while it is being treated by irradiation; to observe the regression of the cancer by means of retrograde gastroscopy, using a child's esophagoscope or a cystoscope passed through the gastrostomy, and to insert additional gold radon

seeds under direct vision into the cancer from the mucosal side. This latter procedure may be done at different times as the cancer regresses and various parts of it come into the field of vision. The stomach is distended with air after the gastroscope is introduced through the gastrostomy, as this permits better visualization of the mucosal involvement by the cancer. The cardiac stenosis produced either by the cancer or by the scar resulting after radiation therapy is relieved by bouginage either by mouth or retrograde through the gastrostomy.

External irradiation to the cancer is then given either by high voltage roentgen rays or by the radium element pack. The radium element pack contains four grams of radium and has a filter equivalent to one millimeter of platinum. It is applied at a distance of 15 cm. from the skin and is given over three portals anteriorly, left laterally and posteriorly to cross fire at the tumor. One hundred thousand to one hundred twenty thousand milligram hours are given to each of the three portals; the time consumed in this treatment being three to four weeks with daily treatments.

The patient is fluoroscoped and the skin areas corresponding to the location of the tumor are carefully delineated in order that the radiation beam be correctly directed. The antero-posterior and lateral measurements of each patient are recorded and drawn on cross section anatomical charts in order to permit a correct estimate of the depth dosage. The set-up for x-ray treatment is: 200,000 volts, 70 cm. target skin distance, 0.5 mm. of copper filter, 30 milliamperes, and skin portals approximating 12 x 16 cm. in diameters. Each portal receives as high as 3,000 roentgen units given in fractionated doses of 250 to 300 roentgen daily over a period of three or four weeks. This quantity of radiation produces an erythema, even vesication of the skin. It is tolerated by most patients who are in good condition at the time the treatment is started.

Some of our best results have been obtained by using a target skin distance of 150 cm., but this distance is so great that the time required for treatments is too long to be practical and economical in an institution where many patients are to be treated. It does, however, enable the radiologist to deliver a considerably greater depth dose into the gastric cancer with preservation of the integrity of the skin and normal intervening tissues, which is the aim of successful irradiation.

Surgery remains the method of choice in the attempted cure of gastric cancer. The seemingly insurmountable handicaps to successful irradiation of gastric cancer are being met to such a degree that we may hope to increase its sphere of usefulness. However, at present we must consider its use as solely palliative.

SUMMARY

(1) Many gastric cancers are inoperable at the time the first sign or symptom is experienced by the patient.

(2) Precancerous lesions in the stomach are limited chiefy to chronic gastric ulcers, gastric polyposis and achylia gastrica.

(3) A two-stage gastric resection is indicated especially for elderly patients who are poor operative risks because of chronic pyloric obstruction and its consequent dehydration and starvation. A preliminary gastro-enterostomy followed in ten to fourteen days by partial gastrectomy is a relatively safe procedure in the treatment of carcinoma of the distal third of the stomach.

(4) Total gastrectomy is employed for cancers of the cardia and fundus if the esophagus is not involved, the tumor is confined to the stomach and the subject is a good operative risk.

(5) It is better to supplement gastro-enterostomy with an exclusion of the distal cancerous segment as a palliative measure for inoperable stenosing cancers of the pylorus and antrum. The advantages of this procedure are: less hemorrhage, less anemia, improvement in appetite, digestion and strength and less tendency to later obstruction of the gastro-enterostomy stoma.

(6) Ten per cent of gastric cancers are radiosensitive. The ulcero-cancers, the diffuse superficial carcinomas and the bulky adenocarcinomas occurring, especially in the cardia and fundus, regress after suitable irradiation. Certain rare small cell carcinomas of the stomach resemble lymphosarcoma in their response to x-ray and radium therapy. With the present technic, the results obtained must be considered palliative rather than curative.

(7) External irradiation by high voltage roentgen rays or a radium element pack is given in fractionated doses through multiple skin portals. The dose thus delivered is supplemented by the interstitial use of gold radon seeds either

through a gastrostomy or directly into the tumor at the time of laparotomy.

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NARCOLEPSY*

WITH SPECIAL REFERENCE TO THE CAROTID SINUS REFLEX

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The therapeutic value of ephedrine in this condition has been one of the most interesting discoveries of the last few years. Cases of intermittent and irresistible somnolence that had been unimproved for years, on use of the drug immediately obtained complete relief, and at the same time agonizing cataplectic attacks disappeared. The change in the patient is really dramatic. Daniels[1] reported in September, 1932, that sixty-eight out of eighty-four cases of narcolepsy were distinctly benefited by the drug, while six more were helped temporarily. In the three cases of definite narcolepsy reported here two were entirely relieved as long as they continued the ephedrine, while the other was distinctly benefited.

The syndrome of narcolepsy was given renewed interest in 1924-25-26, when Perrier,[2] Symmonds,[3] and Spiller[4] found that it occasionally followed encephalitis. Adie,[5] in 1926, considered the condition to be closely linked to the "tween brain," namely, the region of the third ventricle and tuber cinereum. He applied the theoretical considerations of Pavlow, explaining the overpowering drowsiness by means of cortical and subcortical inhibition. S. A. K. Wilson,[6] in 1928, on the other hand, thought the condition a symptom complex and spoke of the narcolepsies. He thought that the spells of somnolence seldom took the form of normal sleep and showed that the cataplectic attacks and somnolent spells frequently were substituted one for the other or verged one into the other. His opinion was that the condition was a variant existing somewhere between the catalepsy of dementia praecox on one hand and epilepsy on the other, all the time dependent on some unknown physiologic abnormality.

This feeling of Wilson's has been strengthened by the fact that ephedrine causes both the somnolence and the cataplexy to disappear. The hypothesis of Williams and Harding,[7] developed from the work of Bancroft,[8] would also parallel Wilson's idea when these authors speak of conglomeration and dispersion of the intracellular colloids. They claim that in catalepsy the colloids are too widely dispersed, while in epilepsy as well as narcolepsy there is too much conglomeration, so that ephedrine and sodium thiocyanate or sodium rhodanate, being dispersers, should give relief in these conditions. Many other causes for this upset physiologic state have been tabulated. Wilson's classification, based on etiology, into first, traumatic, psychopathological (hysteria), endocrine, epileptic, toxic-infective (encephalitis), circulatory, and pressure groups (tumors); and, second, an idiopathic type for which no cause can be discovered, covers in the best way the causative factors. However, most cases show some signs of pituitary dysfunction, a rather fixed, apprehensive facies, as well as lowered basal metabolism, for which neither thyroid nor pituitary give adequate, if any, relief, showing the symptom complex has in part a unitary structure.

The psychogenic factor has been stressed by many writers and it has been noted that the cataplexy of the narcoleptic seizure is very similar to the cataleptic seizure of the hysteric. Adie, especially, denies hysterical origin of this malady, yet, if one considers hysteria as a conversion phenomenon and the cataleptic spells, fainting attacks and paralyses symbolic representations of suppressed conflicts, one cannot help but feel that narcolepsy may be caused by a very similar phenomenon. There is a certain detached attitude and appearance to patients so afflicted that suggests the encephalitic mask on the one hand and on the other the "belle indifference" of the hysteric. During the cataplectic spell there is a similar closing of the eyes, the same appearance of semi-awareness as in the hysterical faint, except the patient with narcolepsy will often make slight movements apparently in his effort to respond either to his hallucinations or to conditions around him, sug-

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gesting the movements of one who wakes from a dream. Again it is suggested that an underlying physiologic process is set in motion, first by a stimulus of one order, and again by a stimulus of another, while for some reason ephedrine reacts directly on this physiologic process.

In *Medicine* for September, 1933, Soma Weiss and James P. Baker[9] reported a study on the "Carotid Sinus Reflex in Health and Disease." These investigators found that with pressure on the carotid sinus in persons with normal cardiovascular systems there was no response in 30 per cent of the cases, while in the rest there was a fall in the systolic and diastolic arterial blood pressure of less than 10 mm. of mercury and very little slowing of the heart. In 55 per cent of these cases the slowing of the heart was absent or less than six beats per minute. However, when they studied fifteen patients who, with two exceptions, complained of spontaneous attacks of dizziness and fainting, pressure of graded severity on one or on each carotid sinus produced dizziness, fainting and convulsive seizures. In these hypersensitive patients they found that one of the following conditions occurred on carotid sinus stimulation: first, marked asystole or sudden slowing of the pulse with or without a fall in blood pressure. Asystole lasting twelve seconds was reported and a heart rate of five to fifteen per minute; second, marked fall in blood pressure without cardiac slowing. They obtained a drop of systolic pressure from 140 mm. of mercury to 58 mm. of mercury. Third, a marked paling of the face followed by an intense flush was obtained, but without essential slowing of the heart rate and without fall in the blood pressure. They found also that patients with marked cardiac slowing were elderly persons usually with some degree of coronary arterial disease, while those with marked drop in blood pressure had slight arterial hypertension, and those in whom they caused fainting without evidence of changes in the heart or peripheral vascular system were suffering from unstable central vasomotor apparatus with psychologic responses of a neurosis. But beyond all this, they discovered that the carotid sinus reflex was entirely annulled by ephedrine, a finding to be expected, as the drug increases cardiac output, stimulates the accelerator nerves to the heart, and has a direct constrictor action on the vascular system, thus counteracting the pressor and dilator action of the sinus reflex.

Case 1.—On August 2, 1933, A. R., a white male of 26 years of age, a graduate student in the University of Virginia, entered the Out-Patient Department complaining of sleepy spells and spells of weakness. His

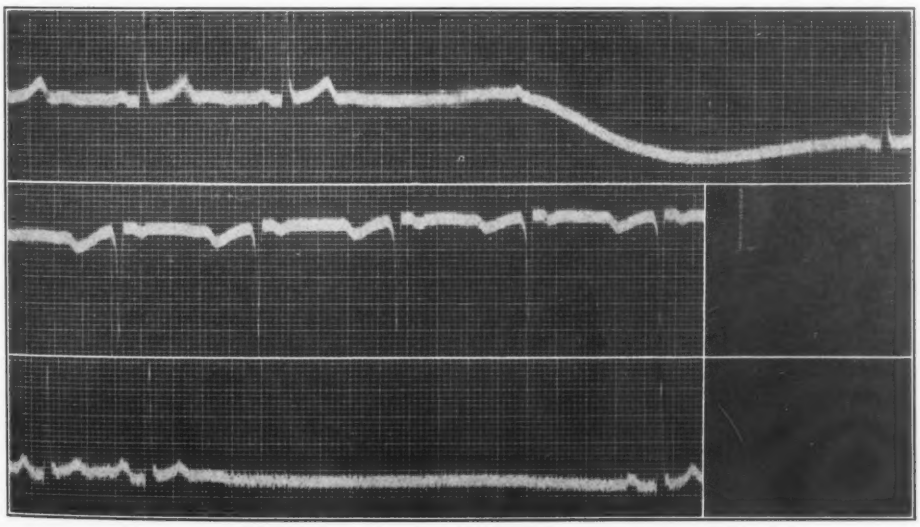

Fig. 1
Carotid Sinus Reflex.
Top—Case 1. Narcolepsy showing asystole of 4.16 sec. Heart rate 14 per minute.
Center—Case 1. After ephedrine for 48 hours. Heart rate 49 per minute.
Bottom—Case 2. Narcolepsy showing asystole of 3.5 sec. Heart rate 17 per minute.

morbid somnolence began in 1923. He would go to sleep in the morning in spite of any noise of disturbance. In 1926, he found that he went to sleep while walking and occasionally walked as much as fifty feet while asleep. During this same year he noticed that when he became "tickled" over something his muscles relaxed suddenly, this relaxation lasting about a second. Also, auditory and visual hallucinations began to occur at night, when, while feeling wide awake, he heard and saw animals, persons whom he knew, and strangers in his room, yet, on attempting to turn on the light, to cry out, or to move, he was unable to move a muscle. This man was studied in Phipps Clinic for several months in 1927, where a diagnosis of narcolepsy was made. The report from this Clinic showed a low basal metabolic rate and stated that he was given thyroid with slight improvement. During 1928, he taught school, but often went to sleep while the pupils were reciting. Next he attended Teachers' College at Radford and finally the University of Virginia Summer School. He came into the Neuropsychiatric Clinic in desperation, as he could not stay awake in class, was having frequent cataplectic spells, and was troubled almost nightly by vivid hallucinations.

Examination showed a well-developed man with practically immobile facies. His blood pressure was normal, his basal metabolic rate was minus 29. All other studies were normal. The epinephrine test showed a vagotonic curve. He was put on ephedrine with striking relief. His spells disappeared, he was no longer sleepy and had no hallucinations. His relief was so prompt that pink soda capsules were substituted for the drug, but the symptoms immediately returned. Since then he obtains entire relief from ⅜ grain of ephedrine three times a day, but with this dose he has some difficulty sleeping. He decreased his dose to one ⅜ grain capsule and almost immediately had a return of his hallucinations. His carotid sinus reflex was tried and his blood pressure fell from 125/68 to 104/55 and his pulse from 64 per minute to 15 per minute, when the patient became very dizzy. The reflex was then tried while he was standing and with the cardiac asystole he staggered and apparently lost himself momentarily. The reflex was tried again and again with each time a similar result. Electrocardiogram showed a heart standstill of four and sixteen-hundredths seconds, a rate of fourteen per second. The patient was put on ephedrine for three days, ⅜ of a grain three times a day, then the carotid sinus was stimulated, producing a slight slowing of the rate from seventy-five to forty-nine per minute, while the blood pressure fell from 125/85 to 112/85, practically no change.

Case 2.—C. C., a young man of 27 years, entered the hospital June 28, 1933. He had chronic mastoiditis with a draining ear, which he had had for eleven years. Ten years before, the patient began to have spells of overpowering sleepiness so frequently and regularly that he had not been awake ten hours on a stretch in ten years. He averaged four short naps each day. This sudden somnolence overpowered him while running his machine in the mill, causing him to be in constant fear of falling into it, although so far the gradually increasing drowsiness allowed him to shut off the machine before he fell asleep. After two to three minutes' sleep he would awake entirely refreshed. Paralleling these attacks of somnolence he had spells of helplessness on excitement. In a moving picture he always propped his chin up with some object lest during some exciting moment his head fall forward against the seat in front. The patient was somewhat restless in his sleep at nights, but described no hallucinations. He stated that his attacks were fewer when his ear was draining freely.

Examination showed no abnormality except the somewhat anxious, fixed expression and the chronic mastoiditis. All his tests were negative, although he was studied thoroughly. Ephedrine, ⅜ of a grain three times a day, was prescribed with immediate relief. Soon after this a radical mastoid operation was done, which has resulted in great physical improvement. Now he takes only one capsule of ephedrine in the morning and gets along without any spells. After this man had been taken off of ephedrine for twenty hours the carotid sinus reflex was tried with a slight drop in blood pressure from 110/75 to 105/70, but a change in pulse rate from 84 to 17 with dizziness and definite facial paling followed by cyanosis. Electrocardiogram showed an asystole for 3.5 seconds. Probably more marked results would have been obtained if the ephedrine had been stopped sooner, as it had been shown that its effect on the cardiac response lasts thirty-five to forty hours (see *Fig. 1*).

Case 3.—A. D. L., a white man 23 years of age, entered the hospital in June, 1933. For one month he had had spells of overpowering drowsiness, occurring especially in the morning, although they might occur at any time. He went to sleep at the table when eating. Two weeks previous to admission this patient began to have sudden seizures of a different nature. First there was a tingling sensation, then a feeling of vertigo, next he had a wave of helplessness and fell to the floor. He did not lose consciousness, was aware of everything around him, but could not move a muscle. He heard "bees coming after him;" these terrified him, he would attempt to arouse himself, and finally by great effort moved. Then his normal condition returned. This man was observed frequently in these attacks, when he seemed to be in a "twilight sleep," first showing absolute immobility, then a few slow movements, followed by awakening.

Examinations of this patient were entirely negative. The basal metabolic rate was minus 5. Blood sugar taken during the attack was 95 mg. per 100 c. c. He was put on ephedrine sulphate with immediate relief, but in about three weeks his spells began to recur; since when, in spite of an increased dose, both his somnolence and cataplexy occur almost daily. Yet the patient claims that he could not get along without the ephedrine because of his feeling of well being as well as his slight relief. His carotid sinus reflex was tried when he had had no ephedrine for five hours and again after he was off the drug twenty-four hours. There was practically no change in blood pressure. His pulse slowed from seventy-five to the minute to fifty-three, which is more than normal slowing. There was some paling and he complained of vertigo, suggesting a cerebral vasomotor change. It is interesting that this patient, not relieved by ephedrine, showed a less sensitive sinus reflex (see *Fig. 2*).

Case 4.—A. W., a white girl of 28 years, entered the hospital on September 17, 1933. Her right leg had been paralyzed for over a month following a fall down the steps. This leg was cured by suggestive therapy after a rather stormy course, so there can be no doubt that her main reaction was hysterical in nature. However, since the age of 13 she had had unconscious spells.

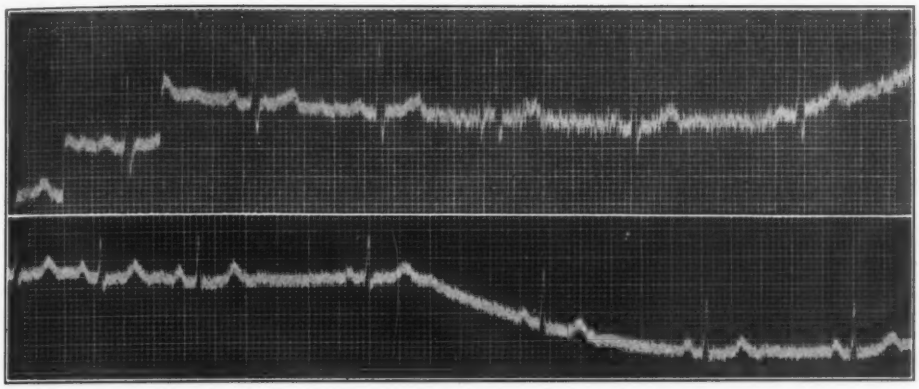

Fig. 2

Top—Case 3. Narcolepsy showing slight slowing. Heart rate 48 per minute.
Bottom—Case 4. Hysteria showing marked slowing. Rate 51 per minute.

The first occurred after she was "tickled" by a boy at school. These spells have occurred at intervals since then whenever there was undue strain or excitement, causing her to be apparently "unconscious" for one or two days. Several of these attacks occurred while she was in the hospital, and under observation they were so similar, except for their duration, to those of A. D. L., the narcolepsy case just described, that it was felt there must be a similar underlying pathologic condition. During one of her spel's, A. W. was found to have a systolic pressure of 80 and a diastolic of 65.

While sitting in a chair her carotid sinus was stimulated. The blood pressure dropped from 110/70 to 90/60, she became dizzy, nauseated, and passed for a few moments into her cataplectic state. The change in pulse rate was also striking. She had an asystole of 1.16 seconds, while her rate dropped from 107 to 51. In other words, she showed no such cardiac effect as in the two narcolepsy cases, but much more change in her peripheral vesse'ls. Her reflex was hyperactive.

The findings in narcolepsy were so striking that it was decided to try the reflex in somewhat similar situations, so the next few cases are given in the way of controls. The first is a case of convulsions due to hypoglycemia, interesting especially as Seale Harris[11] reported narcolepsy in this condition.

Case 5.—J. P., a young man 20 years of age, entered the hospital May 17, 1933. Soon after puberty he had a severe sinus infection, following which he had his first convulsion, and since has averaged at least one a year. His attacks were initiated by a mist before his eyes, then his hearing was dulled, there was roaring in his ears, and flashes of light occurred. Following this he became unconscious for about five minutes, then semi-conscious for about twenty minutes. Of late, this young man had been having queer spel'ls when he felt "panicy," became "trembly" all over, his stomach felt peculiar and he was afraid. He was found to have a blood sugar of 57 mg. per 100 c. c., and has been relieved by a high carbohydrate diet. The carotid sinus reflex in this case caused no change in blood pressure and a very slight slowing in pulse rate. The result suggests that the convulsions in hypoglycemia have little to do with cardiovascular nerve supply. Certainly the carotid sinus reflex was not especially active (see Fig. 3).

The next case showed a peculiar muscular weakness which suggested the cataplectic state and, as it was undoubtedly due to conversion phenomenon as well as to more superficial emotional disorders, should be classed as a hysterical reaction.

Case 6.—Mrs. J. L. B., a woman 41 years of age, was first seen in September, 1933. She complained of weakness and a tired feeling of a great many years, but especially during the last two years. She became so weak that she could not walk up the stairs and had to crawl. She would walk along the street for a short way and then be forced to sit down on the curb. She had always been overweight, but recently had increased in weight. Her basal metabolic rate was slightly below normal. She was given thyroid and pituitary without results. She was found to have a myasthenic reaction with electrical current and following this she was given creatin and glycine, also antuitrin. Still her weakness and fatigue and inability to get around continued. Following a distributive analysis of one hour daily for three weeks, she improved tremendously and now is able to walk ten blocks, is able to do her housework and is to all purposes well except at times when she is unduly excited. If this occurs she immediately becomes weak all over, can hardly get around and cannot keep her head up. These spells last for a period of at least 48 hours.

Her carotid sinus reflex showed a slight fall in blood pressure and a slowing in pulse rate beyond that which would be expected in a normal individual (see *Fig. 3*).

Next a case of effort syndrome was studied representing the best example of psychic disturbances of heart rate.

No.	Diagnosis	Before Reflex			After Reflex		
		Heart Rate	Blood Pressure		Heart Rate	Blood Pressure	
			Systolic	Diastolic		Systolic	Diastolic
1	Narcolepsy	64	125	68	14	104	55
2	Narcolepsy	83	110	75	17	105	70
3	Narcolepsy	85	120	80	48	100	60
4	Hysteria	104	110	70	51	90	60
5	Hypoglycemia	80	120	70	66	128	80
6	Hysteria	100	150	90	68	130	90
7	Effort syndrome	87	110	70	50	95	50
8	Anxiety state	93	140	80	75	130	70
9	Hysteria	93	130	80	68	130	80

Fig. 3

Case 7.—C. H., age 26 years, entered the hospital in October, 1933, with a history of discomfort in his heart and down the left arm, starting suddenly four months ago. Since then he has had many attacks of rapid heart on effort, also while lying in bed. Recently there had been attacks of stomach distress with dizziness and vertigo, during which his whole left side felt weak. After a thorough study we decided that this was a case of anxiety neurosis with effort syndrome. The special fears regarding his heart and stomach were explained, following which apparently he made at least a temporary adjustment.

On carotid pressure there was a slight slowing of the heart rate with a drop of 15 mm. in systolic blood pressure. The man was not considered to have a hypersensitive reflex, rather surprising, as "effort syndrome" cases certainly have hypersensitive autonomic nervous systems (see *Fig. 3*).

Case 8.—This is a marked case of fear reaction in a white man, age 27 years, who entered the hospital on July 27, 1930, complaining of great nervousness and pain all over. He had great fears of heart trouble, tuberculosis and insanity. He was very fearful regarding his eyes and regarding his prostate. These were examined and his chest was examined for tuberculosis, yet nothing could convince him that he was organically sound. Finally he was referred to Westbrook, where he stayed for several weeks, but he is still pursued by his fears now that he has returned home. There is great agitation, psychomotor hyperactivity, yet with depression of affect. The diagnosis is perhaps severe anxiety neurosis. Pressure on the carotid sinus showed practically no change, demonstrating that the psychic factor of pressure had little bearing on the reflex result (see *Fig. 3*).

Finally a case of globus hystericus in a patient who showed fainting spells of hysterical nature, but which were not typical cataplectic spells, was studied.

Case 9.—G. P., a colored woman of 25 years, entered the hospital comp'aining of a lump in her throat which she had had since last January. She had spells of unconsciousness which occurred at frequent intervals. On examination she showed many signs of pituitary dysfunction, was found to have some spasm of the upper part of her esophagus and also of the cardiac end of the stomach when examined by means of an esophagoscope and x-ray. Her condition seemed to be fundamentally hysterical while her spells of unconsciousness suggested cataplexy as she seemed to be unconscious, yet they were not strictly so for, by conversation, she could be aroused and made to obey commands. On carotid sinus stimulation, this case showed slightly more than the normal change in the heart rate and blood pressure as well as no signs of a spell. Of course it is true that she had a very short, thick neck, so it was very difficult to press on the carotid sinus, especially in the sitting position.

Any lengthy discussion of the above findings would be premature because of the shortness of the series and the brief period of observation, but it is interesting to note that the carotid sinus reflex is hyperactive in narcolepsy patients and hysterical patients who have similar reactions. The findings would suggest that the hyperactive, autonomic nervous system explained these spells and also that the action of the ephedrine was the same in this condition as it is in Stokes-Adams' disease.[10] It will be noted that two of the cases which seemed to be undoubtedly narcolepsy showed marked slowing and marked asystole, while the other case showed more than normal slowing and more than a normal fall in blood pressure as well as evidences of change in cerebral circulation. The cases of hysteria showed a decided drop in pulse rate immediately following pressure on the neck and more than a normal fall in blood pressure, yet this was most marked in the case that most closely simulated narcolepsy.

It would seem, then, finally, that here is a possible key to the physiological abnormality behind narcolepsy and to the effect of the ephedrine in this condition. There also is a suggestion that, in the chronic disorder where this crippling condition has continued for so long, the stripping of the carotid sinus with the cutting of the carotid sinus nerve might have curative value.

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DISCUSSION (*Abstract*)

Dr. Frank H. Redwood, Norfolk, Va.—From a review of the literature and from my own limited experience there appear to be two different types of attacks in narcolepsy: one in which the patient is suddenly seized with an irresistible desire to sleep and the other in which there is a sudden relaxation and giving way of the muscles which causes the subject momentarily to fall, the so-called cataplectic attack.

My personal experience has been limited to five cases, the first seen in 1915. Narcolepsy is a syndrome which may be associated with many different causative agents. All of my cases have had signs of a definite endocrine imbalance and one patient, in addition to the cataplexy, had attacks which resembled parathyroid tetany. His blood serum calcium was 6.5 mg. The occurrence of obesity with many cases would further tend to associate a ductless gland disorder with the condition. However, endocrine therapy in my hands has been of no avail whatever, except in one case that improved for one month on thyroid and pituitary.

The carotid sinus reflex in connection with these cases is very interesting. Monckeberg has said that arteriosclerotic lesions at the carotid sinus are the earliest sites of general arteriosclerotic processes, often occurring in young adults and even children, and they cause a positive carotid sinus reflex. I think it is a fact that arteriosclerotic processes are more liable to begin early in neurotic, tense individuals and am wondering what connection this may have in the production of the positive reflex in Dr. Wilson's cases.

The results in the use of ephedrine in the reported cases and in the cases of Dr. Wilson have been, as a whole, very gratifying, but this has not been my observation.

Dr. Wilson (closing).—Dr. Seale Harris' statement that hypoglycemia might explain a great many cases of epilepsy as well as narcolepsy is very interesting, but is not true in a great number of cases, as undoubtedly blood sugar studies are made on the majority of patients having such spells. The case of narcolepsy which he reports as due to hypoglycemia does not seem to me to be a true case. We should be very careful in applying the term narcolepsy only to those cases which show the overpowering sleep and the cataplectic spells on sudden emotion. Undoubtedly there are a great many variations of this picture, but it seems to me that it would be wise to restrict the term narcolepsy to the complete picture.

EXTRA-BULBAR OR DUODENAL ULCER*

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Ulcer of the so-called duodenal bulb was established as a definite pathologic entity more than two decades ago. Deformity of the bulb as a sign of ulcer was first recognized by Lewis Gregory Cole. By inspection from without it was distinctly separated anatomically from pyloric ulcer by the pyloric vein of Mayo. This careful consideration of the usual site of ulceration distal to the pyloric venous necklace placed the frequency of post-pyloric ulcer compared with that of gastric ulcer at a respective ratio of three or four to one. The literature is re-remarkably replete with the description of the symptom-complex and the roentgen signs of the different types of ulcer found. More than nine-tenths of these ulcers occur in that first few centimeters of the gastro-intestinal tract distal to the pyloric valve, which is dilated into a rounded bulb, symmetric with relation to the shape and size of the pyloric antrum, which has no anatomic or physiologic resemblance to the small intestine, and which is now correctly designated by Cole[1] as the "cap" or "pilleus" ventriculi. His exhaustive researches show that the majority of the ulcers occupy the region of the vulnerable band, which lies 0.5 cm. beyond the pyloric valve, and which is the embryological line of demarcation between the fore-gut and mid-gut.

Less than one-tenth of post-pyloric ulcers are more remotely situated in the duodenum proper, or that relatively fixed, retroperitoneal, first small intestinal coil, which begins with the initial plica circularis, and terminates with the duodenojejunal flexure at the ligament of Treitz. The authors who have written on the subject have very strangely neglected a much needed description of the roentgen signs of the extra-bulbar type, or true duodenal ulcer. It is with these ulcers of the duodenum proper, especially of the pars superior and descendens, that we wish to deal. The discussion of the etiology, pathology, clinical symptoms and roentgen signs will be based on the data compiled in the study of a series of cases authenticated by operative findings.

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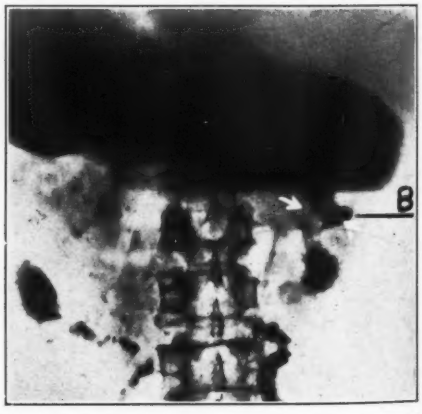
A. Stenotic ulcer of pars superior duodeni with crater on lesser curvature. Duodenum is adhered to pyloric antrum. Note narrowing of duodenal segment. Cap is of spastic type.

ETIOLOGY

This is as problematic as that of gastric or cap ulcer. No hyperplasia has been found in the solitary lymph follicles, which occur in the duodenum along the site of predilection, where the ulcers are most frequent. Virchow's vascular hypothesis of gastric ulcer formation is not applicable. The blood supply to the duodenum by way of the superior and inferior pancreaticoduodenal arteries is quite adequate. The duodenum is a relatively fixed structure and there is no torsion of, or traction on, the terminal branches of these vessels in the muscularis propria or submucosa, such as would produce an ischemia in the duodenal wall, which would be inducive to areas of necrosis with consequent ulceration. In other words, the factors established by Cole,[1] which are found to activate ulceration along the lesser curvature of the stomach, are not present. Moreover, a circumferential vulnerable band of defective blood supply found in the cap at the favorite site of ulcer formation is not demonstrable. There is no acidity of its secretions such as characterizes the completion of gastric digestion in the cap. Theoretically, stasis with its attendant writhing and reversed peristalsis, which is commonly seen in these cases, and which may be induced by other agencies than the ulcer itself, such as an associated chronic cholecystitis, *et cetera,* may play a prominent role in the production of this type of ulcer. It follows that Roessle's spasmogenic theory that spastic contraction of the muscularis mucosae produces continuous compression of the blood supply to the duodenal segments, must be considered. Feldman[2] has called attention to delayed motility as a factor in predisposing the redundant superior duodenum to ulceration.

PATHOLOGY

In our series of cases this simulates that found in both gastric and cap ulcers and apparently depends on the segment of the duodenum in which the ulcer is situated. In the pars superior where the majority of the ulcers occur, the calloused and stenosing types are seen, which are characterized by chronicity, deep craters, and thick ulcer beds with marked deformity, and which do not respond to medicinal measures. In this locality the ulcers appear on the inner curvature of the duodenal arch as a rule. The fibroblastic reaction about them is similar to that found in the deep ulcers of the lesser curvature of the stomach, such as penetrate the intraperitoneal gastric space described by Cole.[1] In those which do appear on the anterior surface and greater curvature of the duodenal ring, which is covered by peritoneum, perforation is the rule, as the fibroblastic proliferation in the ulcer bed is not so active and protective if the peritoneal barricade is available. It apparently ceases to function and permits the peritoneum to stop the onslaught of the etiologic factors at work. In this respect these are comparable to those ulcers which occur at the peritoneal reflection onto the lesser curvature of the stomach as well as those that attack the anterior wall



B. Stenotic perforated ulcer on antero-lateral aspect of duodenum, junction of pars superior and descendens, almost complete obstruction. No. 4 gastric retention.

C. Constant peripheral filling defect in pars descendens duodeni with spastic incisura on opposite curvature. Many tarry stools and general asthenia. Indurated mass the size of a walnut found at operation with much injection of blood supply.

of the cap. In the redundant types of superior duodenum, which have been reported by Cole[1] and Feldman,[2] and which are prone to ulceration, superficial ulceration with diffuse duodenitis as described by Kirklin[4] is usually found, and not the true deep ulcers which penetrate the submucosa and muscularis propria.

As we proceed into the pars descendens of the duodenum, where the annular valvulae conniventes of the mucosa are more numerous and of greater height, the ulcers become less frequent. They do not occur along the lesser curvature of the arch, but on the outer and posterior aspect. There is a tendency to rapid healing as in gastric ulcer. The process of repair may be so rapid, especially in the ulcers of the greater curvature, that instead of a distinct niche at the time of examination, a definite filling defect is found due to cicatricial contraction of fibrous connective tissue in the ulcer bed with obliteration of the adjacent intervalvular space. Yet, stenosis of the lumen has not been observed.

CLINICAL SYMPTOMATOLOGY

True duodenal ulcer is characterized by very protean symptoms. The emphatic and convincing ulcer syndrome is not always present. There may be the mimicry of chronic cholecystitis with gaseous distention and eructations immediately after meals, or occurring several hours postprandially. The patient may complain of nocturnal epigastric pain, which awakens him from his sleep. Nausea is commonly noted, and in the stenosing ulcers, vomiting several hours after the ingestion of food. Recurrent attacks of weakness, pallor and rapid pulse may be the presenting symptoms. Again, hematemesis or tarry stools with general asthenia are the dominant features of the clinical picture.

ROENTGEN SIGNS

It is true that under normal conditions the duodenum does not lend itself very readily to roentgen examination by reason of the rapid transit of the bariumized meal through this first small intestinal coil. However, when a lesion is present in any of the duodenal segments, and often in chronic cholecystitis, peptic ulcer and appendicitis, delayed motility with stasis may occur in the duodenum, which may continue into the six and nine-hour periods. The Kerkring folds, representing the plicae circulares, stand out conspicuously in both the erect and prone postures. This distention of the parts with the bariumized contents facilitates intelligent examination where it is often most needed. In suspected cases where the barium filling of the duodenum is not adequate for accurate roentgenologic interpretation, due to recent catharsis or prolonged starvation, artificial dilatation of the duodenal loop may be practiced by the introduction of an Einhorn tube as recommended by

Six-hour radiograph. D. Ulcer crater in pars descendens, posterior aspect, rare cases. Note the marked duodenal stasis.

Cole.[1] The roentgen findings may be classified into direct and indirect signs.

Direct Signs.—In the pars superior duodeni these are characterized by the constant presence of a distinct crater or niche on the inner aspect of the ring, or niche with accessory pocket on the anterior surface or greater curvature. An accompanying marked distortion and narrowing of the duodenal segment as well as dilatation proximal to the site of ulceration is often noted. In the pars descendens the usual finding is a constant peripheral filling defect rather than a niche on the outer curvature of the arch, which may be associated with an incisura on the opposite curvature. This filling defect is rendered more apparent by the height of the apposing plicae circulares. The craters, when found, occur on the posterior aspect, and are rare. In uncomplicated duodenal ulcer there is never any displacement or angulation of the duodenal loop to the right. If these are visualized, expansive lesions of the head of the pancreas, or a chronic pericholecystitis should be suspected. A localized dilatation with central rarefaction of the barium shadow sometimes noted in the descending duodenum is not characteristic of ulcer, but suggests a tumefaction of the head of the pancreas.

Ulcer craters, especially those on the lesser curvature of the duodenum, must be differentiated from diverticula and filled Vaterian pouches. Pendergrass[3] has recorded the distinguishing characteristics of these. Diverticula are often multiple, ovoid or rounded in shape, and empty slowly. The majority lie in the concavity of the duodenum, and while separated from it by a rarified, barium-filled stalk, they are definitely a part of it, about which they show a relative degree of mobility. While the primary diverticula with their rudimentary musculature may interrupt the transmission of the peristaltic wave, they seldom occur in the superior duodenum, where the larger number of the ulcers are found. The secondary diverticula do not obstruct peristalsis unless they are ulcerated. Ulcer craters are usually single, and commonly irregularly shaped, with rarefaction of the barium shadow at the base of the crater due to admixture of the barium with necrotic debris. In fact, the density of the shadow throughout the crater is often lighter than that in the lumen of the viscus, but the line of demarcation between the two is quite sharp as contrasted with that at the ostium of a diverticulum. With the exception of the filled accessory pockets, they empty rapidly. The broad peristaltic wave which characterizes intestinal motor phenomena, and which is produced by contraction of the longitudinal and circular muscular coats, is usually obstructed, as the majority of the ulcers are deep, traverse the submucosa, and accomplish rupture of the fibers of the muscularis propria. Filled Vaterian ampullae always lie on the mesial aspect of the pars descendens. They are much smaller than diverticula, vary in shape from a small barium fleck to a tubular or bilocular structure, and retain the barium only momentarily. Often they contain translucent areas of rarefaction in the center of the shadow cast by them.

Indirect Signs.—These are both gastric and duodenal, and are frequently the "hypers" of ulcer of the cap itself, such as gastric hypertonus, hyperperistalsis and hypermotility. Localized tenderness may be present, but it is not constant. If the ulcer is remote from the cap, the latter is often dilated and fills well. On the other hand, if it is adjacent to the cap, or at the junction of the first and second duodenal segments, then the cap is of the diminutive type and very spastic. The characteristic duodenal stasis is often enhanced by reversed peristalsis from the pars transversa into the pars descendens, which phenomenon of "back-flow" occurs in at least half of the cases. A gastric residue is commonly present, especially in the calloused and stenosing ulcers, and this finding in a stomach of unbroken contour associated with hyperperistalsis, a normal cap, and normal cholecystograms is almost diagnostic of ulcer of extra-bulbar position.

SUMMARY AND CONCLUSIONS

(1) A review of the literature reveals that a description of the roentgen signs of ulcer of the duodenum proper has been grossly neglected.

(2) A series of ten cases has been studied and presented, all of which have been proven by operation.

(3) The etiology of this type of ulcer is obscure, yet duodenal stasis must be considered of paramount importance as a predisposing factor. Its almost constant occurrence renders the lesion susceptible of detection.

(4) While the majority of the ulcers appear in the pars superior, they do occur in the pars descendens, where they are peculiarly charac-

terized by a constant peripheral filling defect rather than an ulcer crater.

(5) The clinical symptomatology is quite varied and the roentgenologic method of examination offers the most certain means of approach in establishing the diagnosis.

(6) Too often we limit our attention to a study of the cap, when the offending lesion lies in the duodenum.

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DISCUSSION (*Abstract*)

Dr. A. B. Moore, Washington, D. C.—The post-peritoneal situation of the distal duodenum renders its exploration, both surgically and roentgenologically, extremely difficult and in my experience inaccurate.

My impression has been that ulcers distal to the bulb are extremely rare. The few that I have seen have been manifested clinically by hemorrhage, this hemorrhage being usually massive and alarming. I have found no chain of symptoms that indicates their presence. We must be guarded in our opinions and remember that particles of opaque material may be pent up in folds of the bowel, thus leading to the suspicion of a true crater.

It might be well to stress the fact that the duodenal cap has no normal dimensions, and that in cases of redundancy an ulcer may be quite distant from the pyloric ring and yet be within the confines of the true bulb. Several of the cases illustrated here, I believe, would fall in this group.

Dr. Robinson (*closing*).—While the duodenal bulb, or cap, may normally assume many shapes and vary in size, I feel that the position of the first plica circularis will always determine whether an ulcer crater is within the cap or in the duodenum proper. Craters proximal to the first Kerkring fold should be termed cap ulcers, and those distal to it, duodenal ulcers.

The treatment of the stenosing and perforating types of duodenal ulcer as well as those that produce alarming hemorrhages, is strictly surgical. Though they are almost as difficult of approach as some of the duodenal diverticula, the perforating and hemorrhagic ulcers must be exposed. In the former, the ulcer-bearing area should be excised if possible. In the latter, the area of ulceration must be located and cauterized if excision cannot be accomplished. In the ulcers occurring in the descending duodenum, the surgeon must often resort to transduodenal section to locate the ulcer crater. In the stenosing types of ulcer, which are usually found in the superior duodenum, a posterior short loop gastro-enterostomy as a rule gives complete relief of symptoms.

TRAUMATIC MYOSITIS OSSIFICANS*

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Various forms of myositis ossificans have been described in the literature. The "stone-man" in Ripley's Odditorium at the World's Fair has created quite a great deal of interest. My own experience has been exclusively with the traumatic type of the disease and it is this form that I wish to discuss.

One is certain in most of these cases that no fracture exists, therefore an x-ray is not made until after the patient complains a great deal or until a hard mass is felt on palpation. By the more frequent use of the revealing x-ray, many cases will be discovered that would otherwise be overlooked.

Just why two individuals can sustain practically the same trauma and one develops myositis ossificans and the other does not, is an interesting problem. It is commonly claimed that some individual predisposition must be present which permits this pathological condition to develop. In the progressive form of myositis ossificans, a congenital ossifying diathesis is surely present in a much larger measure than in the traumatic type under discussion. Either a single or repeated trauma seems to me to be the major cause. The injury to the part is often much more severe than when a fracture is sustained. Following the extreme trauma, there is marked extravasation of blood into the muscle tissue and into the intermuscular septa. The muscles themselves are badly torn and an injury to the periosteum takes place. The injury is either in the form of a tearing or stripping, or of a general bruising of the periosteum over a large area. Openings large enough for the osteoblasts to be transplanted into the traumatized muscle tissues are made; and the stages of development take place from undifferentiated connective tissue cells to cartilage cells and finally to the true bone cells. In the early stages of the process proliferation of bone occurs at the margins of many small areas of cartilage, degenerating muscle, or blood clots, and proceeds by continually invading these areas. This gives the mottled appearance that is noted when an x-ray is made early. In the

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later stages the picture is that of ordinary cancellated bone.

The cases that receive a severe single trauma are usually entirely disabled. Enormous swelling takes place in the injured part, a certain amount of edema is present, and a pitting on pressure is noted. In from ten to fifteen days, the usual time for swelling to go away, marked induration takes place and a definite mass persists. The mass becomes more firm and in about eighteen to twenty-one days it assumes rather definite proportions. Calcification takes place in about two weeks. At this time, a rather dense shadow is seen. The mass remains stationary for a long time, after which it increases in density and decreases in size.

The relationship of myositis ossificans to compensation and the various forms of accident insurance offers an interesting field for study. It would be possible for disability to be more prolonged in a case that developed myositis ossificans than in one that received an ordinary fracture. It would be exceedingly hard to explain the pathology involved to the ordinary jury that one faces in giving medicolegal testimony. One who does industrial work will do well to familiarize himself with the condition in order to make an accurate diagnosis and to be certain that his patient is dealt with fairly.

Ossifying subperiosteal hematoma is distinguished from myositis ossificans by the fact that the former is intimately connected with the bone by a broad base, while the latter is separated, in part or *in toto*, from the normal bone structure. Periosteal sarcoma has perpendicular bony striations which are quite different from the horizontal downgrowth seen in myositis ossificans. The sarcoma progresses rapidly in size. In myositis the growth is stationary, or retrogressive, after the first stage. It is claimed that a small percentage of cases of myositis ossificans, with extensive irregular ossification, become malignant after an interval of years.

Case 1.—A man, age 23, came to my office on September 20, 1926, complaining of pain in the lower third of the left thigh. He had been injured by being thrown against the goal post while playing football on September 15, 1926. Swelling had appeared in the thigh immediately after the injury and he had been unable to flex his leg completely on his thigh. He complained of pain in the left thigh upon walking and he suffered decided pain from any trauma to his thigh. The patient had been given vigorous massage by the college trainer.

On examination diffuse swelling was noted over the lower half of the left thigh. He was decidedly tender on deep pressure and complained of pain on walking. A hard tumor mass three and one-half inches long and from one and a half to two inches wide was felt on the posterolateral aspect of the thigh.

On October 5, 1926, a hard mass was felt on the posterolateral aspect of the lower half of the left thigh. It was impossible accurately to outline the mass. At the junction of the middle and lower thirds, the left thigh measured one inch more than the right.

X-ray taken October 14, 1926, showed an indistinct shadow in the soft parts about three and one-half inches long, 5 inches above the knee, which was dense and apparently attached to the bone.

At operation on December 20, 1926, a bony mass five and one-half inches long and one and one-half inches wide at its base was removed. The mass was firmly united to the muscles and it was necessary to dissect away a part of the muscle in order to remove it. The patient made a temporary recovery.

Pathological Report.—Many pieces of soft cancellous bone, with muscle attached, were examined. The presence of old hemorrhage in these pieces was evident.

Microscopic examination showed osteogenetic tissue infiltrating the muscle. Connective tissue, cartilage and new bone were present.

The patient returned June 1, 1927, saying that approximately two months after operation he noticed a return of the mass in the same situation, that the mass grew rapidly and caused him considerable pain on walking. Examination revealed a hard mass, seemingly firmly attached to the femur, in the former operative region. X-ray showed a dense shadow two and one-half inches long and about one-half inch wide on the posterolateral aspect of the left femur. Operation was agreed upon, as the patient was anxious to play football during the coming season. The old scar was removed and a firm bony growth about four inches long was found. It was definitely attached to the femur by cancellous bone. The outer layer of the cortex was chiseled. Pathological examination was the same as reported at the first operation. The patient made a complete recovery and has had no trouble since that time. X-ray taken November 22, 1927, showed a firm bone scar.

Case 2.—A boy, age 17, came under my observation on December 1, 1931. He had received a terrific injury to the left thigh while playing football in the early part of September. It was diagnosed by the trainer as "Charley-horse." Vigorous massage had been instituted even though the patient complained of great pain. The patient kept scrimmaging, thereby receiving repeated trauma.

On examination a hard mass was felt extending from the area of the greater trochanter down to approximately the junction of the middle and lower thirds. The soft parts were indurated and the upper third of the thigh measured about three-fourths inch more than the right thigh. The patient was instructed to apply moist heat and not to massage the part.

X-ray showed a bony mass eight and one-half inches long extending distally, parallel to the shaft of the femur, its width varying from one-half to seven-eighths inch. There was a definite separation from the shaft from one-eighth to one-half inch. A thin line one and a half inches long separated the proximal end of the mass from the area of the trochanter. The up-

Fig. 1-a, Case 2
Showing definite attachment of the proximal end of mass to the femur (picture made December 17, 1931).

Fig. 1-b, Case 2
Mass is seen much more dense, more homogeneous and smaller (picture made August 15, 1932).

per one-third of the mass was dense and the lower two-thirds was made up of wavy strands.

On August 15, 1932, approximately one year from the initial injury, the patient came in for examination, as he was anxious to play football. The measurements of each thigh were practically the same. The patient did not complain of any pain. A firm mass could be felt deep in the soft parts of the upper outer one-half of the thigh. The x-ray showed a mass having apparently the same density as the femur. The wedge-shaped proximal end is one and one half inches long and seems to be definitely attached to the femur in the region of the greater trochanter. The mass is seven and one-half inches long. The diameter is uniform and the greatest width is nine-sixteenths of an inch.

This patient played football during the season of 1932 and suffered practically no inconvenience from the presence of the mass. An x-ray taken October 8, 1933, showed practically no change except that the distal end of the growth has become spear-shaped as compared to the beak-shaped growth on August 15, 1932. At the present time he is playing football on the freshman team at the University of Tennessee. He suffers no inconvenience whatsoever.

Case 3.—A man, age 22, came in for examination on January 10, 1933. He gave history of having received a severe injury to the left thigh in October, 1932, with typical "Charley-horse" thigh. He was treated by most active massage. At the same time he had a decided injury to the left knee and he came in for aspiration of fluid from the knee joint.

Physical examination showed the measurements of each thigh to be the same. A hard tumor mass about four inches in length was felt deep in the anterior group of muscles of the middle third of the left thigh. The mass was not movable. No treatment was instituted, as the patient was not having any disability caused by the mass. Two ounces of fluid were aspirated from the left knee.

X-ray taken February 1, 1933, showed a dense shadow six inches long, the lower point being five inches above the patella. Two dark shadows were seen in the lower end of the mass. Practically the entire mass seemed to be attached to the femur.

The patient was again examined on October 3, 1933. There was some atrophy of the muscles of the left thigh. A hard mass was present over the anterior surface of the middle third of the femur. X-ray at this time showed a rather dense and homogeneous bony growth three and one half inches long and one-fourth to one-half inch wide, which appeared to be firmly attached to the femur, the lowest point being five and three-quarter inches above the patella. The mass was definitely smaller, more dense and more homogeneous than that shown in the x-ray taken eight months previously.

Case 4.—A boy, age 18, was first seen immediately after having received a single injury to the left thigh November 12, 1931. I was called to see the patient by the trainer for the football team. The entire thigh was markedly swollen and represented a condition similar to that seen in the "tense calf." He was in evident pain and suffered intensely upon the gentlest palpation and upon walking. He was sent to the infirmary of the school and was placed under the care of the school physician. I did not see him again until February 22, 1932, when he came in complaining of a mass in the outer part of the upper third of the left thigh.

On examination a definite mass was palpable, about four inches long, the upper end of which was approximately three inches from the proximal end of the femur.

X-ray showed a dense homogeneous mass four inches long and one-half inch wide at its greatest diameter. Practically the entire mass seemed to be attached to the femur. The distal end was pointed and extended outwardly into the muscle tissue.

The patient insisted upon removal of the mass, as he was extremely anxious to play football during the coming season. Operation was performed in the pa-

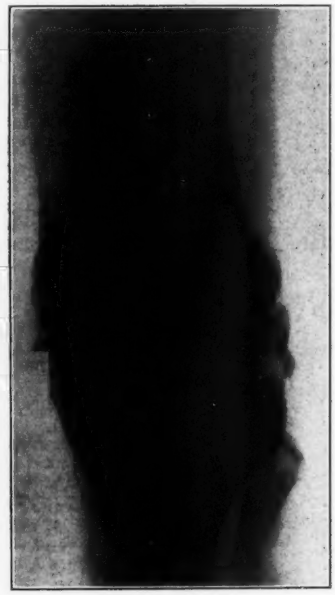

Fig. 2, Case 6
Showing ossification of external lateral ligament of knee.

tient's home town in June, 1932. I understand that he has had no further trouble.

Case 5.—A man, age 22, came under my observation on February 24, 1933. He gave a history of having been injured in 1931 while playing football on one of the South's leading college teams. He had had the usual extreme trauma to the left thigh. He gave a history of having had a mass removed from his left thigh about four months after the injury.

Physical examination revealed a palpable mass about eight inches long located deep in the muscles of the anteromedial portion of the left thigh, which seemed firmly attached to the femur.

X-ray taken February 24, 1933, showed a dense shadow eight inches long and one half inch wide, apparently growing from the femur on the medial side. The lower end was four inches above the knee joint. It was impossible to see the medial border of the femur. The other edge of the mass was slightly irregular in contour.

As the patient did not intend to play football any more, no treatment was suggested.

Case 6.—A boy, 19 years of age, was brought to my office on December 19, 1932. He complained of pain in the right knee following an injury received in football during the early part of the season. Accumulation of fluid was present in the knee joint and limitation of flexion was noted. He complained of pain on palpation on the outer side of the knee. He said that he had attempted to continue football during the remainder of the season after receiving his injury, but suffered a great deal of pain when he played.

X-ray taken December 19, 1932, showed a calcified area one and one-half inches long and five-sixteenths inch wide, which lay to the lateral side of the distal end of the right femur and extended to the edge of the tibia.

On account of the pain complained of and the interference with motion, an operation was advised. However, the patient did not return for operation.

Case 7.—A man, age 41, received a severe injury on May 16, 1927, to his left elbow and forearm. He was brought to the hospital by a physician from a neighboring town. The left forearm and elbow were markedly swollen and discolored. He was seen four days after the injury.

X-ray showed a posterior dislocation at the left elbow and a compound fracture of the middle third of the radius and ulna.

The posterior dislocation of the elbow was reduced and open operation done on May 24, 1927, to reduce the fracture of the radius and ulna.

X-ray taken June 23, 1927, showed apparently firm union in fractures of the radius and ulna. A dense shadow one and one-fourth inches long and one-half inch wide in the center, tapering at each end, was seen just proximal to the olecranon fossa of the humerus. A hard mass was palpable deep in the brachialis anticus just proximal to the elbow joint.

Case 8.—A man, age 22, came under my observation in November, 1931. He had received a blow on the upper left arm on September 12, 1931, while playing

Fig. 3, Case 7
Shows a triangular ossification following posterior dislocation of elbow. Excess callus formation is noted showing synosteosis of radius and ulna.

Fig. 4-a, Case 8
Shows an ossified area at junction of middle and upper thirds to the outer side of humerus.

Fig. 4-b, Case 8
X-ray made year and a half afterward shows no return of the mass.

football. He continued to play football. He said that the same area was injured repeatedly.

Physical examination showed a definite circumscribed, hard tumor in the soft parts of the left arm, lateral to the humerus, and three and one-fourth inches from the shoulder joint.

X-ray taken March 16, 1932, revealed a definite calcified area one and one-half inches long and three-eighths inch wide at the junction of the middle and upper thirds in the lateral portion of the arm. The mass was separated from the humerus by a space of one fourth inch.

Under local anesthesia a hard bony mass one and three-fourths inches long, with the base averaging one-eighth to three-fourths inch, was removed. The mass was attached to the shaft of the humerus by soft, cancellous bone. The patient made an uneventful recovery and is playing football at the present time without any discomfort or evidence of recurrence. X-ray taken November 22, 1933, showed a slightly raised area at the site of operation, with no evidence of return of the ossifying mass.

Case 9.—A man, age 40, suffered severe trauma to his back in an auto accident in November, 1929. There was an enormous contusion over the entire lower thoracic, lumbosacral and right gluteal regions. He complained continually of pain in his back and gluteal region. X-rays at this time showed transverse fracture of the eleventh rib on each side. Repeated x-rays did not reveal any evidence of fractures to the lumbar vertebrae, sacrum, or pelvis Eight weeks after the injury was received a hard, indurated mass could be felt in the right gluteal region.

X-ray taken January 14, 1930, showed an irregular shadow of very slight density one and one-half by three-fourths inches, located in the soft parts just posterior to the right of the sacrum, but inferior to the right sacro-iliac joint. X-ray taken on March 7, 1930, showed the shadow to be more dense. X-ray taken May 23, 1930, showed the shadow to be still more dense.

When the patient was last seen a hard, indurated mass could still be felt on palpation in the gluteal region. He complained of great pain upon walking and sitting.

Case 10.—A man, age 62, came in on December 5, 1931. He had been in a car wreck a year before, in which his head had been thrown forward suddenly. He experienced only slight pain, but had numbness and tingling sensations in the extremities and body. Five days before he was brought to the hospital, the patient slipped on the porch and fell to the ground. His head was thrown suddenly forward again.

Physical examination showed swelling and induration in the muscles of the back of the neck. The patient had complete paralysis.

X-ray showed an old compression fracture of the fourth and fifth cervical vertebrae, with union along the anterior border of the bodies. Three-fourths inch posterior to the spinous processes of these two vertebrae, there were two irregular, dense shadows, each approximately one-half inch long and three-sixteenths inch wide. These are undoubtedly ossifications in the posterior muscles of the neck, which resulted from trauma at the time of the initial injury.

Fig. 5 is taken from Geschickter's book on bone tumors.

Fig. 6 shows the distribution of my ten cases. Five of my cases occurred in the left thigh. In seven cases the injury was sustained while playing football. In none of these cases was there an associated fracture, while in the other cases fractures were present. All of my patients were males. The youngest was 18 and the oldest 62.

I feel that the treatment for myositis ossificans is essentially conservative. Rest in bed with the part in a hot boric pack is of first importance. Following this procedure, the patient should be allowed to walk. If the injury is in the thigh, crutches should be used until the patient can walk without much discomfort. Walking is much to be preferred to vigorous massage. Heat in the form of lights and moist packs should be continued. I have observed several patients with extreme trauma to the thigh who did not develop myositis ossificans. X-rays were made at intervals in these cases. The following is an illustrative case:

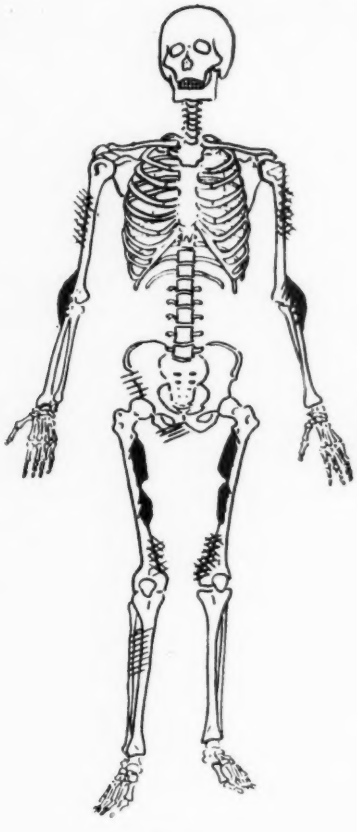

Fig. 5

Showing incidence of myositis ossificans according to skeletal location. The solid black areas indicate the most frequent sites; the checked areas, the common sites; the diagonal line areas, the occasional sites. (From Geschickter's book on bone tumors.)

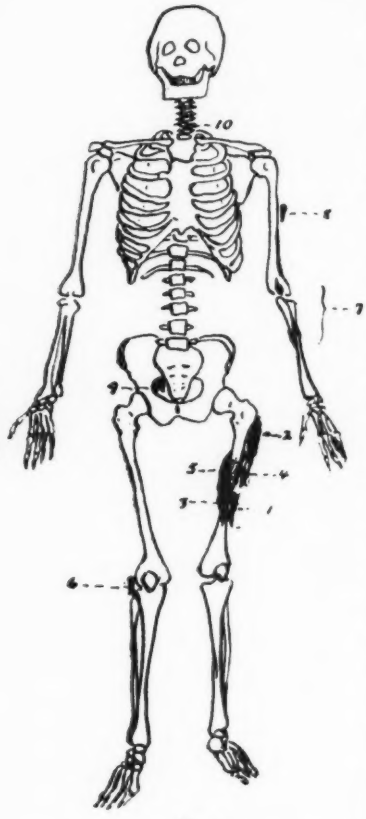

Fig. 6

Showing distribution of cases reported in this series. Five are shown in the left thigh. Seven occurred in football players.

A boy, age 17, received a most severe injury to his right thigh in a football game on November 26, 1932. Enormous swelling took place immediately. When he was seen, just after the game, the pain was so intense that he was taken to the hospital and his right thigh and knee placed in a moist, hot boric acid pack. Several hypodermics were given for relief of pain. He was dismissed from the hospital after two days. There was still marked swelling of the entire thigh and a large amount of fluid was present in the knee joint. He was instructed to continue the treatment of heat and rest, but not to massage the thigh and knee.

It was approximately three weeks before this patient was able to discard his crutches. Physical examination at no time revealed a palpable bony mass. The swelling did not leave entirely for approximately six weeks. X ray made one month after injury did not show any evidence of bone injury or of myositis ossificans. X-ray made on October 8, 1933, was negative for myositis ossificans.

I feel certain that the vigorous massage instituted in *Cases 1, 2* and *3* greatly exaggerated the condition.

It is very important not to operate until a dense shadow is shown in the x-ray. I would think that one should wait at least six months after the initial injury. The recurrence in *Case 1* was undoubtedly due to the fact that operation was performed too early. The same is undoubtedly true in *Case 6*. It is interesting to note that an interval of four days had elapsed before the posterior dislocation was reduced in *Case 7*. It is of prime importance to reduce these cases early and to immobilize in flexion, so as to have as little trauma and extravasation of blood as possible, and to do away with a potential space where the products of hemorrhage can accumulate. Traumatization of muscle tissue with hemorrhage plays a large part in the etiology of myositis ossificans. The large amount of callus at the site of the fractures of the radius and ulna is worthy of note. This patient was a splendid producer of callus. Individuals undoubtedly possess this faculty to a varying degree. This may be an important factor in determining the extent of the process of ossification in myositis ossificans. The more one studies cases of myositis ossificans, the more one is impressed with the intimate relationship between the bony growth and the normal bone structure.

I have never seen any patient survive long

who had the trauma noted in *Case 9*. Hemorrhage was of special significance in this case.

The ossification in *Case 10* is of little importance.

S. L. Mucklow, in the *British Journal of Radiology*, reports favorable results obtained in the treatment of two cases of myositis ossificans with the x-ray. A decrease in the size of the mass was noted in x-rays made ten weeks after the initial treatment. In closing, I should like to stress the following points.

(1) Preventive treatment is most important. All football players should have their thighs well protected with padding. Posterior dislocations should be reduced early and properly immobilized.

(2) Conservative treatment is advisable in all cases in which one thinks myositis ossificans may develop and in those cases seen after the process has begun.

(3) If operation is absolutely necessary, postpone the date of operation until a dense homogeneous shadow is shown in the x-ray. If operation is postponed, as suggested, it will rarely be performed, as most cases are symptom-free by this time.

DISCUSSION (*Abstract*)

Dr. Robert W. Johnson, Jr., Baltimore, Md.—There are two points concerning this condition which I feel warrant special emphasis, though they have been touched upon already in the paper: first, as to the origin of the bone formation. It is most frequently seen in connection with injuries involving the bone, or at least the periosteum, and the inference can easily be made that the bone cells which proliferate spectacularly have their ancestry in pre-existing normal bone cells. This is, in my opinion, entirely erroneous, as at least one case just demonstrated shows, and I have observed the same fact independently quite frequently. It is quite in order for undifferentiated connective tissue cells, of whatever paternity, such as are seen in any organizing blood clot, to develop along osteogenetic lines if local biochemical conditions are favorable for their so doing. Only thus can be explained many cases of osteogenesis seen without any connection with pre-existing bone. This protean possibility of connective tissue cells must be borne in mind in all our traumatic and surgical work.

The second point is the conservatism which must be used in treatment of this condition when it does exist. The usual measures of exercise, massage and heat only tend to aggravate the osteogenesis when once it is started, and rest, rest, and more rest of the part is needed to minimize it. Operation should never be done until all the bone has become adult, and should be done then only in case of mechanical necessity, as the likelihood of local recurrence is considerable and the possibility of malignant change definite, if slight. Finally, cases similar to a recent one of mine may occur, so I want to drop a hint. A case was sent to me, by an excellent surgeon in a small town, with a huge, hard, tender, hot mass involving most of the deltoid muscle, and the history of a fall three months previously and a bony mass in the deltoid which had been excised six weeks previously. The sections of this were reported to the surgeon as osteogenic sarcoma. I studied the sections and x-rays and both looked very suspicious, though the sections did seem more like callus in structure than like the typical picture of sarcoma. I felt that even a shoulder girdle operation was now hopeless as a life-saver if the condition was malignant, and so simply immobilized the shoulder in an aeroplane splint and applied icecaps for several weeks. The swelling began to subside, the heat soon left, and in three months the child was at home with a good, useful arm. It was just a case of myositis ossificans which had blazed up when treated surgically in the active plastic stage. So while malignant degeneration must always be considered a threat, remember that irritated and proliferating tissues, if treated with rest and quiet, may respond by becoming tame and docile again.

Dr. Austin T. Moore, Columbia, S. C.—It has been suggested that liberation of osteogenic cells is not necessary for production of myositis ossificans. I wish to mention a case, a man about forty years of age, who had been treated for sciatica for approximately twelve or fifteen years by various physicians. On x-raying this patient, we found a dense shadow which was apparently bone and which lay deep in the gluteal region. Flexion of the thigh caused sciatic pains. We operated upon this man and found a long pencil of bone about the size of one's little finger and about six inches in length lying deeply embedded in the gluteal muscles with one end attached by adhesions to the sciatic nerve. The bony tissue, of course, was removed and the patient recovered.

We could find no explanation whatever for this bony growth until several months after the operation the patient recalled that he had at one time in his life had something injected into his buttocks. Apparently the chemical irritation caused the bony deposit to form.

Whether this should be called myositis ossificans, I am not sure.

Dr. Campbell (closing).—I do not think that infection plays any part in the development of myositis ossificans. It is very hard to duplicate in the experimental laboratory injuries that are sustained in automobiles and while playing football. It is intensely interesting to watch the progress of these cases from the time they are injured through the months and years that follow. I intend at a later date to report on the progress of my cases.

NORMAL AND PATHOLOGICAL LARYNX UNDER SUSPENSION LARYNGOSCOPY*

By F. E. LeJeune, M.D.,
New Orleans, Louisiana

The anatomical situation plus the complexity of movement within the laryngeal box is responsible for the fact that this structure occasionally presents formidable problems in study and diagnosis. The normal larynx can always be taught the student who masters the use of the laryngeal mirror. The various pathological conditions occurring within the larynx are not to be found in every day work, except in the larger clinics. The scarcity of such material increases the difficulty of teaching clinical pathology of the larynx. Certainly some method of accurately recording pathological lesions of the larynx is desirous for our records and for teaching. Cinematography of the larynx under suspension laryngoscopy provides a most excellent and accurate method for the recording of pathological laryngology.

Suspension laryngoscopy permits a deliberate, accurate and direct examination of all parts of the larynx. The anterior commissure is well exposed and the subglottic region may be observed by either retracting the vocal cords or by the use of small mirrors. I have found high magnification of great help in many cases. Consultation with the pathologist in perplexing and borderline cases has always been a source of comfort and help. The free use of both hands in all intralaryngeal surgery is of tremendous importance and helps to simplify procedures which would otherwise be extremely difficult. As a means of approach to intralaryngeal surgery, suspension laryngoscopy is the method which I prefer. It is responsible for my successful work on photography of the larynx and permits me to present for your observation and discussion motion pictures of the following cases:

Normal Cases.—Several views of normal larynges are presented showing the anatomy and intricate movements of the larynx as seen by direct inspection (*Figs. 1* and *2*). The anterior commissure, false and true, ventricular bands, vocal processes, intra-arytenoid space and arytenoids are clearly and distinctly shown.

The vibration of the vocal cords on expiration is an interesting phenomenon to observe. Abduction on deep inspiration discloses the fact that the laryngeal aperture is surprisingly large and it is easily understood from the observation of this picture how and why many foreign bodies find their way into the trachea and bronchi, particularly of children. Complete adduction of the ventricular bands is accomplished by the action of the crico-arytenoideus lateralis and intra-arytenoideus muscles. In this view we obtain an excellent idea of what happens when there is a spasm of the glottis. The cords are seen coming and remaining together firmly. Respiration temporarily ceases until the strong abductor muscles slowly force the ventricular bands apart. Increasing the speed of the projector conveys to the eye the impression that the cords, particularly the vocal processes, approximate with great force. Excessive use of an inflamed larynx must produce this type of traumatism, resulting frequently in contact ulcers, vocal nodules and hemorrhagic blebs. The accumulated secretion within the trachea and bronchi must be expelled through the laryngeal aperture. The mechanism of this expulsion forms a most interesting observation. The expiratory blasts plus the movements of the larynx are important factors in the expulsion of secretions.

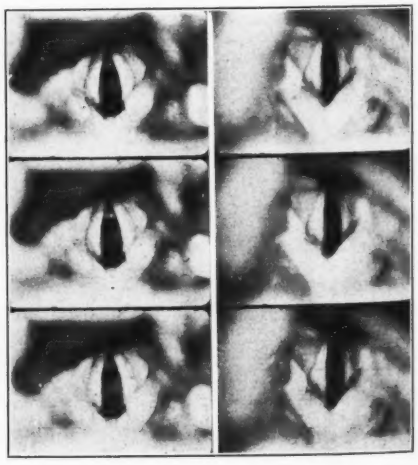

Fig. 1 Fig. 2
Views of a normal larynx.

*Read in Section on Ophthalmology and Otolaryngology, Southern Medical Association, Twenty-Seventh Annual Meeting, Richmond, Virginia, November 14-17, 1933.

*From the Department of Otolaryngology, Graduate School of Medicine, Tulane University, New Orleans.

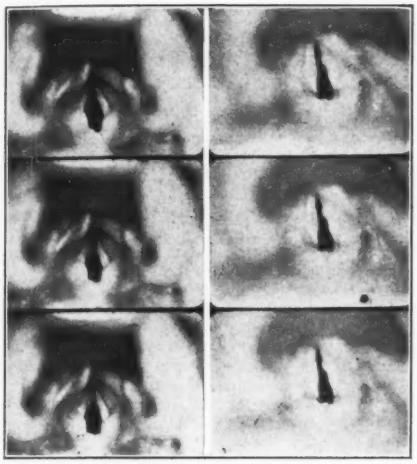

Fig. 3 Fig. 4

Fig. 3. Vocal nodules on both cords.
Fig. 4. Single nodule on right vocal cord.

PATHOLOGICAL CASES

Case 1.—Mrs. H., aged 32, complained of persistent hoarseness of two years' duration, occasionally becoming worse. Examination showed vocal nodules to be responsible for her husky voice (*Fig. 3*). By means of suspension laryngoscopy the larynx was exposed to direct vision and the vocal nodules were carefully examined. Observation of these pictures clearly demonstrates the existing pathologic condition at the junction of the anterior and middle third of the ventricular bands. In the process of adduction it will be seen that the nodules come together first, acting as a wedge by preventing the posterior two-thirds of the vocal cords to approximate accurately. Rest and proper pitching of the voice are frequently successful in clearing many cases of vocal nodules. When the above fails to accomplish the desired end, it becomes necessary to remove the nodule surgically. The nodules were removed by grasping them with a Lynch side grasping forceps and shaving them off by means of a sharp laryngeal knife. The postoperative results are presented for observation.

Case 2.—This is a motion picture demonstration of a single nodule on the right vocal cord, producing hoarseness (*Fig. 4*). By means of suspension laryngoscopy this was removed under direct vision in the usual manner, and postoperative photography shows the final results.

Case 3.—Multiple papillomata of the larynx with recurrence in adults, while not considered rare, are, however, seldom seen. The pictures presented here are of a white woman, aged thirty-eight, who came under my observation about seven years ago (*Fig. 5*). She gave a history of repeated operations and of several applications of radium to the larynx. The partial destruction of the epiglottis is thought to be due to the use of the radium and it is further thought that radium has been a factor in the present distortion of the larynx. Of course the surgery necessary in the removal of the papilloma must result in the production of fibrous tissue which also plays an important role in the pathologic appearance of the larynx. In a period of seven years it has been necessary to remove papillomata (multiple) on three occasions from the larynx of this patient. The papillomata were of the multiple type and attached to the superior and free surface of the vocal cords. They were removed carefully by means of forceps and every attempt was made to guard against creating any new raw surface.

Case 4.—Multiple papillomata in children behave differently from papillomata in adults and also from papillomata elsewhere in the body. Multiple papillomata of the larynx in practically every case tax the ingenuity and patience of the physician. The repeated recurrences after painstaking operations are discouraging to both physician and patient. The pictures presented of papilloma of the larynx range from a small group attached to the anterior commissure to complete occlusion of the larynx by this type of growth. Numerous therapeutic measures have been tried in all of these cases with varying degrees of success. I have had cases which cleared up completely, thoroughly and permanently after one or two removals; others, using the same technic, have been subjected to repeated operative procedures with indifferent success and rapid recurrences. The two most noteworthy papilloma cases in my practice have been operated thirty-four and ninety-one times, respectively. A detailed report of these cases will be presented in the near future. At the suggestion of Dr. J. H. Foster, three of my papil-

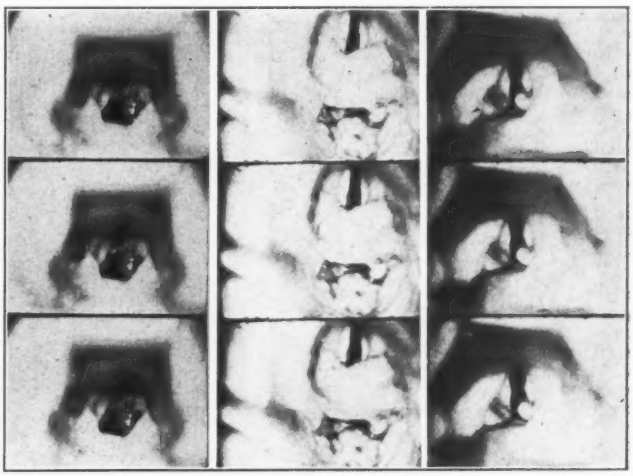

Fig. 5 Fig. 6 Fig. 7

Fig. 5. Multiple papilloma of larynx.
Fig. 6 Inoperable carcinoma mouth of esophagus, showing relation to normal larynx.
Fig. 7. Hemangio-endothelioma growing from junction of false cord and arytenoid.

loma cases are now receiving fractional doses of x-ray. While it is rather early to draw any definite conclusions, the three cases show some improvement.

Case 5.—Carcinomas of the hypopharynx and mouth of the esophagus present a uniformly unfavorable prognosis. The case presented here is one which occurred in a man 56 years of age who complained of difficulty in swallowing for the previous few months. Examination of the hypopharynx and larynx with the laryngeal mirror proved so unsatisfactory that suspension laryngoscopy was advised. This was done under the influence of sodium iso-amylethyl barbiturate (sodium amytal) and morphine. A good exposure is presented for your observation showing the lesion and its relation to the larynx (*Fig. 6*). An extensive carcinomatous involvement of the mouth of the esophagus was found. Both arytenoids showed some thickening. Otherwise the larynx was normal. Section of the growth was that of a squamous cell epithelioma and clinically it was of such extent that surgery was entirely out of the question. Radiation was resorted to with the usual poor results in this type of case.

Case 6.—Mr. J. D. E. was first seen in July of 1930, at which time indirect examination of the larynx showed a small growth, which appeared to be granulation tissue, attached to the right arytenoid. This was removed under suspension laryngoscopy and the report of the pathologist was "Fibrous connective tissue covered with granulation tissue. Positively no malignancy."

In October, 1930, there was a recurrence of the growth at the same place. It was again removed under suspension and the base coagulated by diathermy. Fixation of the right cord and arytenoid promptly occurred after the use of diathermy coagulation. In addition to the above there were three recurrences of the growth at the same location, all removed in the same manner, the last removal being in August of 1931. In January, 1932, the patient again came in complaining of pain in the region of the larynx. Upon examination a growth was seen springing from the junction of the false cord and arytenoid cartilage on the right side (*Fig. 7*). The motion pictures of this pathological condition are of unusual clarity and depict the existing lesion in bold relief. The tumor was removed in the same manner as were the others and the base coagulated. This is well demonstrated in the postoperative photographs. Pathological report on the tumor removed was "hemangio-endothelioma." There has been no recurrence of any tumor formation since its removal twenty-three months ago.

Case 7.—A view is presented of an intrinsic carcinoma of the larynx showing involvement of one cord. The lesion is an early one and involves the anterior and middle thirds of the vocal cord. The arytenoids move freely and the pathology of the lesion is well demonstrated. The lesion was removed by complete dissection of the ventricular band and coagulation of the base. Seventeen months have elapsed since the operative procedure and while it is too early to report results, it is gratifying to know that so far there is no evidence of a recurrence.

Case 8.—This case is presented for the purpose of showing the difference between the intrinsic and extrinsic types of carcinoma of the larynx. Views are presented showing an extrinsic carcinoma of the larynx with involvement of one side, with complete fixation of the cord and arytenoid. While the lesion is apparently confined to only one side, it is of such extent that nothing short of a laryngectomy offers any hope.

Case 9.—In January, 1929, Mr. D. B. presented himself for examination, complaining of persistent hoarseness for the previous six months. Indirect laryngeal examination showed an intrinsic carcinoma on the right vocal cord. Under suspension laryngoscopy this lesion was removed wide of its margin, the entire vocal cord being removed and the base coagulated. The pathological report was "squamous cell carcinoma." In July, 1933, four and one-half years after the removal of the vocal cord, this patient returned with the request from his family physician that we remove his tonsils for the relief of an arthritic condition. Advantage was taken of this opportunity to examine the larynx carefully under suspension laryngoscopy. The condition found is here presented to you. There was no evidence of any recurrence and nature had remanufactured a pseudo-cord which was difficult to distinguish from the true cord under deep anesthesia and while the larynx was at rest. Upon movement the pseudo-cord was seen to be limited in motion. The photographic reproduction of this case shows both cords very well and clearly. Unfortunately the anterior commissure was not caught by the camera. This case to me is most important and significant, as it shows that in the early carcinoma cases intralaryngeal surgery properly done is highly successful.

Discussion follows paper of Dr. Equen, page 780.

CANCER OF THE LARYNX: LARYNGECTOMY*

By EDWARD A. LOOPER, M.D.,
Baltimore, Maryland

Cancer as a cause of death has been increasing rapidly in recent years. A statistical bulletin[1] of the Metropolitan Life Insurance Company, issued in December, 1932, shows that while the average expectation of life at birth has increased over 40 per cent or by seventeen years since 1890, the mortality from cancer has not been reduced, but on the contrary the death rate from this disease has become much higher. In this paper it is stated that at the beginning of the present century tuberculosis ranked first as a cause of death, heart disease ranked third and cancer ranked seventh. Today, organic heart disease ranks first, cancer second and tuberculosis sixth. For the eleven-month period, January to November, 1932, cancer shows a rise of 9.8 per cent in its death rate since last year.

About 4 per cent of all cases of cancer involve the larynx, so that such a serious disease which is definitely advancing deserves our earnest consideration and study.

*Read in Section on Ophthalmology and Otolaryngology, Southern Medical Association, Twenty-Seventh Annual Meeting, Richmond, Virginia, November 14-17, 1933.

After years of intensive scientific investigation, little actual progress has been made in the etiology or even in the prophylaxis of cancer. It is true that excessive smoking, chronic irritation, focal infections and many other causes have been considered predisposing factors, but such conditions can be found associated with other chronic laryngeal diseases and apparently have no definite relationship to cancer alone.

According to Mackenty,[2] 98 per cent of the malignant tumors of the larynx are carcinomas. One per cent are adenocarcinoma; 1 per cent are papillary carcinoma; 2 per cent are basal cell carcinomas, and 96 per cent are squamous cell in character, the serious type.

DIAGNOSIS

Early diagnosis is by far the most important phase of this subject. A recognition of precancerous pathological changes in the larynx by simple indirect laryngoscopic examination has saved many lives. A favorable prognosis depends much more upon a correct diagnosis in the early stages of the disease, before there is extension and metastasis, than upon the special type of operation selected or upon the unusual skill of an operator.

Diagnosis as a rule is not difficult to one who will give attention to well established symptoms, yet it is surprising how many of these cases are unrecognized until they have passed into advanced stages. It is not uncommon for such patients to come in with extrinsic symptoms, giving a history of having been treated for months for hoarseness with ordinary sprays and local applications, while carcinoma was not suspected and no laryngeal examination was made.

One of the most important early symptoms of cancer of the larynx is some alteration in the voice of an adult. The disease is most common in males, and is usually seen in middle and later life, although Clerf[3] has reported a case as early as twenty-one years, and Mackenty[4] a case at twenty and another at twenty-nine years of age.

Any person after the age of forty who slowly or suddenly develops changes in his voice, such as weakness, huskiness, hoarseness or aphonia, without other special physical signs, should be suspected of having carcinoma. A careful laryngoscopic examination should be made and if there are suggestive changes in the larynx, every effort should be made to determine the true nature of the lesion.

The growth usually begins as a localized bulging on one of the vocal cords. The surface of the cord is first attacked, but if the invasion continues the deeper tissues are involved with later extension to surrounding structures. Carcinoma of the larynx has a tendency to involve the anterior two-thirds of the cord, which is a helpful point in diagnosis. The local appearance of the lesion has been clearly described by Mackenty as follows:

"Incipient cancer in an otherwise normal larynx has the following distinguishing features. It has none of the appearances of inflammation. The area around the minute excrescence or bulging irregularity of surface may be normal in color or paler than normal and raised above the surrounding surface. It is rarely pedunculated and is usually flatly sessile and irregular in outline, with little or no demarcation from the normal surrounding tissue into which it fades. It may present early a broken, warty, abraded appearance. Its base or point of emergence from the normal tissue may exhibit vascular activity, as shown by dilated surface venules. Rapid growths often take on a pale yellow or dirty white appearance and suggest, in the diminutive, the later well-known cauliflower appearance of malignancy."

In all cases of new growths in the larynx, the final decision must be made by taking a piece of the growth for microscopical study. This section is easily obtained through a direct laryngoscope, can be quickly made and is not dangerous to the patient.

There has been considerable controversy about the question of biopsy in these cases, but if the section is carefully made and the remaining raw edges of the growth are cauterized by endothermy, there is little danger that metastasis will develop. Of course, one should always be

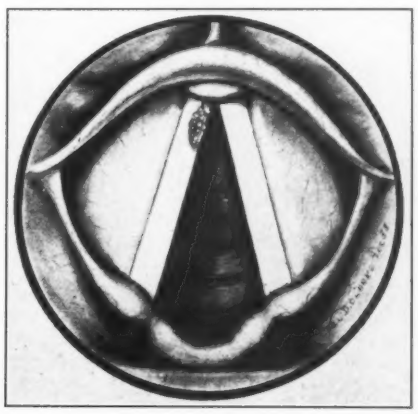

Fig. 1
Carcinoma of the larynx. Early stage.

Fig. 2
Carcinoma of the larynx. Moderately advanced.

prepared to remove the growth as soon as possible after a definite diagnosis has been made.

There are several chronic laryngeal lesions which call for differential diagnosis. As laryngeal tuberculosis is one of the most common chronic laryngeal diseases, a few differential points of the two diseases will be considered.

Tuberculous laryngitis presents a typical picture. It is a secondary manifestation and some general lesion is always associated. The tubercle has no characteristic tendency to involve a certain part of the larynx as is seen in cancer. The lesion may be single or multiple, most often being seen in the arytenoids, the interarytenoid space, the vocal processes, one or both cords, the epiglottis or in the pharynx. The early pathologic changes produce edema, infiltration and later breaking down with ulceration and secondary infection. The ulceration at first is superficial with later extension into the deeper structures, causing irregular loss of tissue. The vocal cords often present the typical "moth eaten" appearance.

The coexistence of the two diseases in the same patient is extremely rare. In a study of over 6,000 cases of laryngeal tuberculosis at the State Sanatorium, I have found only one case of carcinoma associated with tuberculosis.

Chronic laryngitis in which there is some edema or infiltration of one of the vocal cords, in older persons, may at times present a serious problem in differential diagnosis.

One such patient caused me to spend an anxious winter. A physician, aged 52 years, came in complaining of chronic hoarseness. He had had a low-grade infection of his accessory sinuses over a period of time and there was some infection of his pharyngeal and laryngeal mucosa. Inspection of his vocal cords showed an unusual amount of edema and infiltration and a little roughening of the right cord. In spite of all local treatment the infiltration persisted over a period of months and several times I was tempted to take a section for microscopic study. However, I felt that the sinus infection was the cause of his trouble and after an operation the laryngeal lesion slowly began to improve.

In such a case there is a grave responsibility, because if the condition had been cancer, the patient would have suffered by delay; and on the other hand, if it were simply a chronic laryngitis, a biopsy would have been the wrong procedure. Fortunately the case turned out favorably.

Syphilis of the larynx has been uncommon in my practice. Hoarseness occurring in the secondary manifestations of the disease is generally associated with other general symptoms so that a diagnosis can be easily made.

Furthermore, as this is a blood disease, there is usually uniform injection and infiltration of both cords. A Wassermann is also a great help. Cases causing most concern are those in which the patient has a true cancerous growth with syphilis. Many of these cases have been carried into the late stages of metastatic involvement by attempting to treat the lesion as syphilis. In all such cases the question of diagnosis should be decided by biopsy.

TREATMENT

The treatment of carcinoma of the larynx depends upon the individual case, as no common

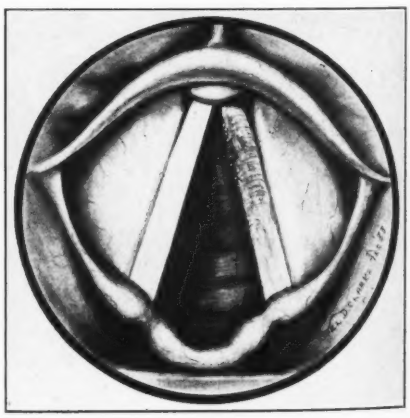

Fig. 3
Carcinoma laryngitis. Infiltrated cord.

method of procedure can be applied to every case. It is now generally recognized that there is considerable variation in the degrees of malignancy. Most of the grading of these different types has been by Broder's method, so that careful study of the type of cancer must be made before the operation is decided upon. The object in any event is to remove the infected area in its entirety. If the cancer is seen in the early stages and it is of a low grade malignancy, then a laryngofissure is applicable. This type of procedure is in great favor with some operators. It has been particularly successful in Tucker's[4] hands. Laryngofissure is much easier to perform than laryngectomy, less mutilating and would undoubtedly be the operation of choice if cases could be obtained in the very early stages.

Endolaryngeal operations have not been very successful in the treatment of cancer of the larynx and it is now seldom attempted with the expectation of obtaining a cure. Likewise, treatment of such growths with radium has been disappointing and it is now used only as a palliative measure. No doubt the inaccessibility of the larynx for direct application has been the cause of failure in some cases. If large doses of radium could be applied directly to the growth as in skin cancer, the results would be better.

I have had an interesting case of this nature. Dr. W., aged sixty-five years, came in with chronic hoarseness. Examination showed a carcinomatous mass in the anterior part of the left vocal cord. Biopsy showed squamous cell carcinoma. The doctor was opposed to all forms of operations and desired to have radium tried. Dr. Burnham devised a special applicator, having the sides screened and the end open, so that a very large dose of radium could be accurately localized directly on the growth. By passing this applicator through a laryngoscope, I was able to keep the radium on the growth for several minutes. Two applications were made at different intervals without any local reaction. This was followed up by deep x-ray therapy. An examination of the patient a few days ago showed no recurrence of the growth, no metastasis, and he has been apparently perfectly well for over a period of three years, so that in some cases radium evidently does have an important part. I feel that the good results in this case were due to the large dose applied directly to the growth. Even after more radical operations we apply radium where there is the slightest evidence of recurrence.

The most satisfactory operation for carcinoma of the larynx, however, is laryngectomy, whereby a complete removal of the growth can be obtained. In the early development of this operation the mortality was so high that it was recommended with great caution. Today when the cases are carefully worked up and have been given the proper preoperative attention, with removal of all foci of infection above and with scrupulous care and the proper operative technic, the operation has become a safe procedure and the mortality is no greater than that of any other major surgical procedure.

My operations have been performed according to the technic developed by Mackenty, the one-stage operation being preferred. One advance in the operation in my opinion has been in the use of avertin as an anesthetic. This type anesthetic is particularly adapted for this operation, it lasts over a long time, there is no anesthetist in the way, no anesthetic tube is required and there is no danger that cold ether will be inhaled into an exposed larynx. This is a distinct danger. It can easily be a predisposing factor in pneumonia, which is sometimes seen as a complication in this operation. With the patient quietly asleep, much time can be saved in the actual operation, which, after all, is an important factor in shock.

I am opposed to the operation under a local anesthetic. It takes much longer and the mental state of the patient must be considered, as it must be very shocking to be awake, realizing that one's larynx is being removed.

As emphasized by Mackenty, it is extremely important to prevent blood from getting into the trachea and bronchi. Also great care should be exercised to see that all bleeding points are carefully tied, with attention to the surgical details and free drainage. My cases have all done well and the results have been extremely satisfactory.

Some of the points in operative technic will be emphasized in the moving picture demonstration which is to follow.

SUMMARY

(1) Carcinoma of the larynx has been steadily increasing in recent years.

(2) Cancer now stands second as a cause of death in all diseases.

(3) Such an advancing fatal disease demands our serious consideration.

(4) Early diagnosis and prompt treatment offer the only hope of control.

(5) The importance of diagnosis should be more frequently emphasized.

(6) Exact diagnosis can be made by microscopical examination of tissue.

(7) Complete removal of the affected area is necessary by radical operation.

(8) Laryngofissure has an important place if cases are seen sufficiently early.

(9) Most cases require laryngectomy.

(10) Laryngectomy is now a safe operation in skilled hands and has no greater mortality than other major surgical procedures.

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Discussion follows paper of Dr. Equen, page 780.

THE TREATMENT OF CANCER OF THE LARYNX: LARYNGOFISSURE VS. LARYNGECTOMY*

By MURDOCK EQUEN, M.D.,
Atlanta, Georgia

At the recent meeting of the American Society for the Control of Cancer it was brought out that cancer is not found among the Eskimos nor among the natives of central Africa, suggesting that extremes of temperature may confer an immunity; but the Indians of Arizona, the tribesmen of the Himalayas and other aborigines also seem to be exempt, so some believe that a diet of coarse natural foods is of greater importance in this regard. Another fact of appalling interest brought out is that 130,000 persons are dying of cancer every year in these United States. It was estimated that for every death there are two new cases diagnosed. No wonder the interest of the public in this dread disease is increasing.

Malignant growths of the larynx, almost always carcinoma, account for approximately 5 per cent of all cancers. Cancer of the larynx occurs most often in men beyond their prime who smoke excessively and who abuse their voices, but it occurs, too, in young persons of both sexes and in non-smokers. It tends to be more malignant in the middle-aged than in the elderly.

Cancer of the larynx not properly treated inevitably kills. Tracheotomy may stave off the horrible death of suffocation, but the end stages of the disease are agonizing. On the other hand, cancer in no other part of the body except perhaps the skin offers earlier evidence of its presence than cancer of the vocal cord or its immediate neighborhood. In no other part of the body is it easier to establish the diagnosis, and when this is done at a fairly early stage, cancer in no other part of the body offers a better prospect of cure.

SYMPTOMATOLOGY

Pain, sometimes local, sometimes referred to the ear, may be the first symptom of cancer of the larynx, but the earliest and most important symptom in most cases of intrinsic carcinoma is chronic hoarseness. Many persons, including physicians, attach little importance to hoarseness: it almost makes one wonder if they are ashamed of the symptom. I suspect that they fail to realize its possibly grave significance largely because "chronic laryngitis" seems such an obvious diagnosis. Hoarseness, which may be intermittent at first, may be present from one to seven years before there is notable interference with breathing. Obstructive dyspnea or dysphagia is a sign of such a late stage that cure is hardly to be hoped for.

DIAGNOSIS

Although fifty possible causes of hoarseness have been listed, hoarseness that lasts more than a few weeks is so often due to cancer that its cause should always be determined. This investigation requires the cooperation of a competent internist. With a careful history and general physical examination, an x-ray of the chest and a Wassermann, the internist should be able to exclude pulmonary tuberculosis (and inferentially laryngeal tuberculosis), syphilis (including aneurysm of the aorta), disease of the central nervous system (tabes, multiple sclerosis, syringomyelia), goiter (mediastinal, cervical or endotracheal, as well as injury to the recurrent laryngeal nerve in the course of a previous thyroidectomy and cancer of the thyroid), and so on.

As every senior medical student knows, however, tuberculosis, syphilis and cancer are the most common and most important causes of chronic hoarseness. But none of this triad excludes either of the other two. The late Dr. J. E. Mackenty once demonstrated a larynx in which tuberculosis, syphilis and cancer were all three present, and Beck has since reported two similar cases. One must therefore always ex-

*Read in Section on Ophthalmology and Otolaryngology, Southern Medical Association, Twenty-Seventh Annual Meeting, Richmond, Virginia, November 14-17, 1933. Motion pictures illustrating the technic of laryngectomies were shown.

amine the larynx itself. The laryngologist begins this examination with careful palpation of the neck itself, noting whether there are external signs of inflammation or induration, whether there is metastasis or direct extension of the growth. His next step is to look at the larynx: its routine inspection would greatly promote early diagnosis.

As has been often remarked, carcinoma of the larynx most often begins in the anterior commissure. It is therefore of the utmost importance to examine this area with particular care. If, as often happens, this cannot be done with a mirror, one must employ either the Lynch suspension apparatus or the Jackson laryngoscope.

BIOPSY

It must be emphasized that mere inspection of the larynx is not always sufficient to make an exact diagnosis. In addition to tuberculosis, syphilis and cancer, one must remember the possibility of "singers' nodes," fungous infections, leprosy, pachydermia, contact ulcer, simple chronic laryngitis, and several types of benign tumors. It is therefore essential to secure a biopsy. The most important thing about a specimen for biopsy is that it should be adequate. This means that it must be of sufficient size and that it must include a part of the transition from normal to pathologic tissue. If the clinical picture is that of carcinoma and the pathologist reports no malignant change, a second or even a third biopsy should be done.

In obtaining tissue for biopsy I use the Lynch suspension apparatus. This apparatus suspends the head so as to make a straight line from the teeth to the vocal cords, and with the light from his head mirror the surgeon is enabled to inspect in turn every part of the larynx. The Lynch method offers the operator the great advantage of being able to use both hands. When the patient is under ether, the cords are abducted; the operator can grasp the affected cord with forceps held in the left hand and pull it toward the midline for meticulous inspection and hold it thus while he dissects with a long-handled knife. I find that I can secure more satisfactory specimens for biopsy by such sharp dissection than by the use of biting forceps. This technic also permits the removal of a tumor that has not extended beyond the cords.

Another reason of profound importance for biopsy, even though there is little doubt as to the diagnosis of cancer, is that the surgeon needs the opinion of the pathologist as to the grade of malignancy.

There is clinical proof in many hundreds of cases from all over the world that biopsy of cancer of the larynx followed in two or three days by a more radical removal is absolutely harmless. This is because, as Krieshaber announced in 1879, the poor lymphatic drainage of the organ and its rigid cartilaginous enclosure inhibit metastasis.

TREATMENT

The treatment of cancer of the larynx is essentially that of treatment of cancer in any other part of the body, that is, early diagnosis and complete removal. Even when the diagnosis is not made early, it is the surgeon's responsibility, if extirpation offers a reasonable hope of cure, to remove the neoplasm *in toto*. Obviously the presence of distant metastasis is an absolute contraindication and the presence of extension beyond the walls of the larynx or of metastasis to the neighboring nodes is a very grave omen, but apparent cures even in a few cases falling in the latter category have been reported by several authors.

It was Lynch's practice to remove early cancers through the mouth by sharp dissection or diathermy if movement of the cords was not impaired. Even if there were lagging from proliferation of the cancerous process through the basilar membrane he sometimes used the same technic.

LARYNGOFISSURE

Laryngofissure (thyrotomy, thyrochondrotomy) consists in opening the larynx in the anterior midline and resecting the neoplasm with at least 6 mm., preferably 10 mm., of apparently normal tissue around it. It is a relatively minor operation, one that is practically devoid of mortality, one that keeps the patient in the hospital but a few days and one that does not greatly alter the voice. In suitable cases, laryngofissure offers about an 80 per cent chance of cure: Jackson has reported one patient living and well 31 years later and another 25 years, as well as four who died of another disease 20 years or longer after operation.

The drawback to laryngofissure is that cases suitable for the operation are not common: less than 20 per cent of the cases of laryngeal carcinoma in a series recently reported by Jackson, who says:

Fig. 1

Mr. B. became hoarse in 1930. A year later a biopsy in another state was pronounced non-malignant. On the strength of a second biopsy, laryngofissure was performed by me in March, 1932. Evidence of local recurrence necessitated total laryngectomy in March, 1933. Mr. B. attended the meeting of the Association in Richmond, and is still (July, 1934) in good general condition. The illustration shows him using the artificial larynx.

"The laryngofissure route is indicated for the removal of early intrinsic malignant disease of the larynx that does not involve the posterior commissure or the mucosa covering the anterior surface of the arytenoid eminence."

Tucker emphasizes that the evidence of glandular invasion into the cricothyroid membrane or into the neck or upper esophagus contraindicates laryngofissure. The Philadelphia school in general holds that the size and location of the growth are the most important factors to be considered. Jackson and Tucker both state that, if laryngofissure fails to cure, it may be repeated a second and even a third time, or that laryngectomy may even then be done.

St. Clair Thomson is somewhat less exacting in the selection of patients for laryngofissure. He modifies the operation in the more advanced cases by excising also the part of the thyroid cartilage which underlies the tumor. This seems to New more radical than is necessary in many cases of low grade malignancy and not radical enough in those of high grade malignancy.

On the other hand, New believes that if the cancer is graded 3 or 4, laryngofissure is not advisable. He has recently demonstrated that in Grade 4 malignancy the cancerous process may extend 15 mm. into apparently healthy tissue. In such cases obviously the excision of 7.5 mm., considered safe by Thomson and Colledge, would leave much of the original growth. Zinn, in particular, thinks that, in view of the uncertain extent of the cancer, it is usually safer and therefore preferable to do a total laryngectomy.

LARYNGECTOMY

In the early days laryngectomy was attended by a very high mortality, as well as the complete loss of voice. None of Billroth's first twenty-five patients survived the operation by a year. Recently, however, the mortality in experienced hands has been reduced to 8 or 10 per cent. Mackenty did thirty-one laryngectomies without an operative death, and New has reported a series of thirty-six consecutive cases with only one death. This reduced mortality has been brought about by the advances in surgical technic and more especially by improvement in the postoperative care. The perfection of an artificial larynx has also largely compensated for the loss of the natural voice.

Laryngectomy may be done under either local or general anesthesia. Avertin by rectum with local anesthesia, reinforced with ether following the separation of the larynx from the trachea, seems to be the method of choice today. Laryngectomy may be done in either one or two

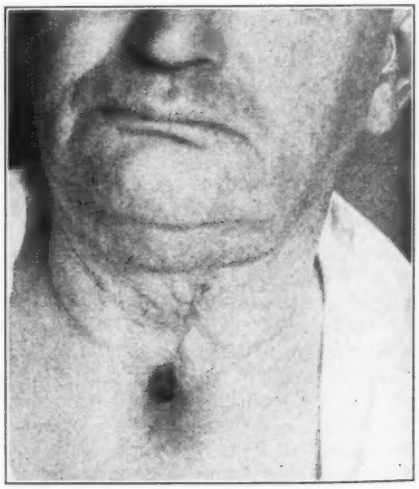

Fig. 2

Dr. B. attributed his hoarseness to chronic laryngitis and his shortness of breath to heart disease. Emergency tracheotomy was done in October, 1933, to prevent suffocation, and this was followed by total laryngectomy for carcinoma Grade 4. Dr. B. also attended the meeting in Richmond. He died in June, 1934, from recurrence of the growth with invasion of the esophagus.

Fig. 3

Mrs. M. had been hoarse three months. Laryngectomy for carcinoma Grade 3 was performed November 25, 1933. The insignificant nature of the scar is well shown in the photograph. She was doing nicely when last heard from.

stages. I agree with Zinn that the one-stage operation is less of a tax on the patient, offers less chance of infection, and avoids the possible necessity for a permanent indwelling trachea cannula and that it is therefore the operation of choice in most cases.

One of the most important points in the operative technic is to sever the larynx from the trachea and to hold the free end of the trachea up out of the way before removing the voice-box in order to prevent blood and secretions from getting into the trachea. The opening in the hypopharynx and esophagus left by the removal of the larynx must be closed watertight and special care in asepsis, hemostasis and drainage must be exercised.

After operation morphine is contraindicated, as it lessens the sensibility of the trachea and abolishes the cough reflex. A tray of sterile instruments to cope with any emergency and suction apparatus must be kept always at the bedside. Constant careful nursing with frequent aspiration through a soft rubber tube of the trachea and larger bronchi to keep them free from secretions is essential. Formerly many deaths resulted from dehydration and starvation: it is therefore of fundamental importance to administer plenty of fluid and an adequate amount of food through a nasal catheter until the anterior wall of the pharynx is firmly healed. As soon as the tracheotomy wound is also firmly healed the patient may begin to use the artificial larynx.

Although the laryngectomized patient cannot go swimming and must even be careful in taking a shower bath, and his artificial voice lacks tone and expression, these patients look remarkably well and are able to enjoy life and to resume almost all of their ordinary, everyday activities. Some are even able to train themselves to use the stomach as a bellows, and thus to talk intelligently without any artificial aid. Even though the loss of the natural voice-box does have its inconveniences and is esthetically displeasing, in contrast looms the inevitable prospect of a most painful death. The extension of the growth compresses the trachea and esophagus so that the patient must breathe through a tracheal cannula and be fed through a nasal catheter. His life becomes one of unutterable agony.

Judd has recently reported patients who were enjoying active, useful lives 16, 18 and 19 years after laryngectomy. Orton has reported 32 cases of laryngectomy: seven patients were living and well 4 years or longer after operation; one had died from unrelated causes; three had died within three weeks of operation, one of these from unrelated causes; ten, all of whom had had extrinsic cancer of the larynx, had died from cancer elsewhere. The largest series of laryngectomies that I know of is that of Fielding Lewis, 157 cases, 82 intrinsic, 75 extrinsic: end-results have not yet been reported.

It therefore remains to speak of cases suitable for laryngectomy. These include those that are considered too far advanced for the simpler operations and all cases of extrinsic carcinoma of the larynx. While the presence of

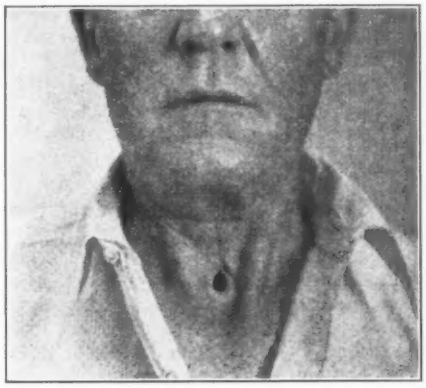

Fig. 4

Mr. P. had been hoarse intermittently for a year. Laryngectomy for carcinoma Grade 4 was done April 7, 1934. He is now able to work.

other unrelated disease which will probably of itself result in the early death of the patient may cause the surgeon to doubt that a radical operation is worth while, the only definite contraindication is the presence of distant metastases. For this purpose an x-ray of the chest is of the greatest importance. When there are small hard nodes in the neck these may be resected at the time of the operation or later; larger, soft nodes are perhaps best treated by radiation. It is well, too, always to follow the operation by radiation. Radiation, sometimes coupled with tracheotomy, often gives marked temporary palliation in inoperable cases.

DISCUSSION

There are, then, three good methods of dealing surgically with carcinoma of the larynx. The simplest is direct excision of the growth, using the Lynch suspension apparatus or the Jackson laryngoscope. This is a minor procedure which does not ruin the voice. It keeps the patient in the hospital but a few days and leaves no external scar. It has the outstanding advantage, in theory certainly, that it leaves intact the hyaline barrier to metastasis. Laryngofissure, though slightly more formidable, affords an opportunity to make a more minute inspection of the larynx and a wider dissection of the cancer. These methods will effect cure in the large majority of suitable cases. The proportion of suitable cases must be increased by earlier diagnosis. Practically also, both of them, particularly the former, enable the surgeon to temporize without much harm in handling a patient who will not consent at first to the removal of his larynx.

Total laryngectomy at an early stage probably would cure all cancers of the larynx. It is the only treatment for the extrinsic type. But many a patient at first refuses to sacrifice his larynx and the operation also carries a certain risk. But even laryngectomy is not warranted in some far advanced cases with invasion of the soft tissues.

Each of these operations has its earnest advocates. Peroral resection by a master like Lynch is to be preferred to laryngofissure by a beginner; laryngofissure by an expert is much safer than laryngectomy by a tyro. In my opinion the ideal state is for one man to perfect himself in the technic of all three, and to decide the best method of treatment in each individual case.

I believe that in very early carcinomas, the Lynch method of removal should first be employed, and the patient examined at frequent intervals for at least a year to detect the earliest evidence if the cancer was not totally removed. If the malignancy is of low grade and the growth a little large, laryngofissure may be done. But if one of these has failed to cure, if the cancer is highly malignant, or if the neoplasm is intrinsic, I would urge immediate laryngectomy.

SUMMARY

Persistent hoarseness demands an accurate determination of its cause. Lesions of the larynx demand a biopsy for diagnosis and for the grading of malignancy if present.

Early carcinomas of the cord may frequently be removed through natural channels. Even though of high grade malignancy, the cartilaginous wall remains intact to serve as a barrier to metastasis and, should it prove that the cancer was not totally removed, it will still be safe to remove the entire larynx.

Carcinomas of low grade malignancy involving the middle or anterior third of either cord, but not affecting its movement, are sometimes best treated by laryngofissure.

Carcinomas of grade 3 or 4, carcinomas that have caused fixation of either cord, or that involve other parts of the larynx, are best treated by laryngectomy. Laryngectomy is absolutely contraindicated only by the presence of distant metastases.

DISCUSSION (*Abstract*)

Papers of Dr. LeJeune, Dr. Looper and Dr. Equen.

Dr. E. M. Sykes, San Antonio, Tex.—Even when the patient is seen early, the correct diagnosis is not always easily made by the usual laryngoscopic methods. Neither does the usual bit of tissue removed by a forceps reveal the true pathology on microscopic examination. For instance, inflammatory or syphilitic processes may possibly be associated with carcinomatous changes, and unless sufficient tissue be obtained the laboratory report may be misleading. Therefore, I believe, to secure a specimen of value, the patient should be suspended, thus giving the laryngologist not only more opportunity to study the existing pathology, but also more freedom in excising the desired tissue.

As laryngofissure has been recommended and successfully practiced by men of prominence, such as St. Clair Thompson of England, Tucker and others of this country, and as laryngofissure should be an operation of choice, if all the carcinomatous tissue can be eradicated, it behooves us to secure more complete data concerning the indications for this mutilating operation.

My personal experience has been that when carcinoma does not involve more than one-third of one mobile cord, is centrally located and has not descended to the lower border of the thyroid cartilage, then favorable results can be expected by removal through laryngofissure.

As the laryngologist cannot predetermine the extent of subglottis involvement, it is a wise plan to secure a preoperative permission to do a laryngectomy, if, on opening the larynx, it is found that the cancer has extended to the lower border of the thyroid cartilage.

I should like to take this opportunity to recommend to this section a procedure suggested by Lieut. Col. George Callender, which would in the course of time standardize the treatment of cancer of the larynx.

It is suggested that all data and material of cases, with the exception of operative deaths, be sent to the Curator of the Army Medical Museum, Washington, District of Columbia, in care of the Laryngological Division of the American Registry of Pathology.

To reach definite ultimate conclusions the following cases should be recorded:

(1) All cases with complete histories and material, including slides, tissue blocks and pathologists' reports before and after operation.

(2) All cases which have been followed to a conclusion.

(3) All cases still under observation the follow-up of which can be continued.

(4) Cases which have been followed up five or more years, even though they were subsequently lost from observation.

These case reports will be filed and tabulated, and every year a card will be sent out to the physician requesting more information concerning the case.

The value of such a central bureau can readily be seen.

Dr. Homer Dupuy, New Orleans, La.—St. Clair Thompson has achieved marvelous results in laryngofissure. This is largely due to early diagnosis of malignancy in the larynx, in which art our English confreres seem to surpass us. Our Charity Hospital cases come to us with advanced neoplasms. In private practice, a fair number report with incipient tumors. When the growth, limited to one cord, does not impinge on either anterior or posterior commissures, laryngofissure is my personal choice.

One new idea which I may offer is the use of an electric knife for removal of the tumor itself. This is followed with electrocoagulation of a large area of the inner wall of the thyroid cartilage. We believe such a technic marks decided progress, as it reduces the possibility that cancer cells will remain in the operated area or enter the surrounding blood and lymphatic vessels. The vocal results are fairly good. The tragic total loss of voice, so demoralizing to the patient, does not occur. Let me emphasize that the sparse lymphatic supply within the larynx makes this organ, when affected with malignancy, a favorable site for surgery. Laryngofissure under local anesthesia has practically a zero operative mortality. Removing fragments of tumor tissue even from the larynx preoperatively is not unattended with the possibility of emigration of cancer cells. Biopsy, by rush section, when the larynx is opened can be done with greater safety. The experienced laryngologist in the great majority of cases has already diagnosed malignancy by gross examination in a given larynx.

Dr. John H. Foster, Houston, Tex.—If we are to get anywhere in the early diagnosis and treatment of cancer of the larynx we must keep hammering on the seriousness of chronic hoarseness as a symptom. These cases are seen early by the family physician and if he is well informed he will have them investigated before it is too late. I have seen good results in our own State and am being consulted more often in early cases than formerly.

In the brief time allotted me I shall touch upon only two points in Dr. Equen's paper: (1) biopsy and (2) selection of line of treatment.

I believe a biopsy should be done in every case. If time permitted I could cite case after case in which on the one hand examination of the tissue has been of tremendous value in directing treatment, and on the other failure to have such an examination has been the source of regret and embarrassment.

I agree absolutely with Dr. Equen on the value of the opinion of a competent tissue pathologist on the grade and type of the cancer. The importance of this is not so generally appreciated as it should be.

In the choice of treatment my own procedure is substantially as follows:

(1) If the tumor is small and can be removed entirely intralaryngeally this is done when securing a specimen for biopsy. The patient is kept under observation for recurrence.

(2) Where the tumor is confined to one side and the report on the tissue shows that the tumor is Grade 1 or 2, or even 3, if small, a laryngofissure is done. In Grade 1 cases, especially if the case is a keratotic one with only beginning malignancy, I have done a laryngofissure where the lesion extended well past the midline in front.

(3) All other cases that I consider operable are advised to have a laryngectomy. A few years ago in a paper on this subject I stated that however valuable radium and x-ray might be in cancer in other parts of the body, they had no place in the treatment of cancer of the larynx. I take this opportunity to retract that statement. The demonstration of the radiosensitiveness of certain types of cancer has been a distinct contribution to this subject. I now use radium in all cases of highly malignant cancer both before and after operation and have seen one case apparently cured by radium alone.

Dr. Equen states that the drawback to laryngofissure is that cases suitable for the operation are not common. He quotes a series of Jackson's showing less than 20 per cent. This is not my experience. More than 50 per cent of my cases of strictly intralaryngeal cancer have been operated upon by laryngofissure and this proportion is increasing with earlier diagnosis. In justification of this choice of operation I will say that I have never had a recurrence after laryngofissure in a case where I thought the operation was clearly indicated. In two cases there was recurrence. One of these patients was 80 years old with high blood pressure and a bad heart. The tumor was extensive, but classified as Grade 1 or 2. After consulting with his physician and his family, I practically exenterated the larynx through a laryngofissure. In about a year the patient showed a recurrence in the scar in midline which was treated with radium. He is in fairly good shape two years after operation. In the other case laryngectomy was advised and refused. Recurrence was prompt after operation and the patient asked for laryngectomy, which was done. There was recurrence in a short time and he died within a year.

Dr. Millard F. Arbuckle, St. Louis, Mo.—It is generally agreed that cancer is a curable disease if seen and treated early. Of course, there are numerous other

factors besides the duration of the disease which have an important bearing on the prognosis. Some of these are: the type of tumor with special regard to its degree of radiosensitivity, its location and consequent effect on function of vital organs, its proximity to lymphatics, and the presence or absence of barriers between the tumors and lymphatics.

The location of cancer of the vocal cord in the early stages is fairly constant and the areas progressively involved as the disease spreads are fairly typical within certain limits. The diagnosis, while at times presenting serious difficulties, usually may be established. One of the most serious difficulties to be surmounted in the treatment of cancer of the larynx is to get those within as well as those outside of the medical profession to realize the importance of a prompt and a competent laryngological examination in individuals who have protracted hoarseness.

More active propaganda by the Committee for the Control of Cancer might help in getting these patients to submit to earlier examination. I speak advisedly of impressing the necessity of such examination upon the mind of the medical profession as well as the lay public. It must be remembered that in the early stages of cancer of the larynx the only symptom as a rule is hoarseness. Unfortunately, this disease in the early stages practically never causes pain, interference with respiration or other discomfort. When symptoms such as blood streaked sputum, dyspnea, pain and glandular involvement are noticed it usually is too late.

Failure to do biopsy always leaves the diagnosis subject to doubt in the minds of those who know; while on the other hand this important step in the study of cancer, when properly carried out, creates a feeling of security and satisfaction, not only in the minds of the patient, but of the physician as well. In cases in which malignancy is suspected biopsy should be done and even though negative if there is reasonable doubt from the appearance of the lesion, it should be repeated until the question is settled.

Of course, the classification of cancer according to its cellular type and consequent radiosensitivity is a question about which there is much discussion pro and con. I am convinced that it is very important from the standpoint of treatment as well as prognosis and I believe the differences of opinion will finally be settled as the result of future experiences. To this end each case should be carefully studied and tabulated with regard to all these details.

Of course, biopsy should always precede operation for the relief of cancer of the larynx even though the diagnosis seems certain. The fact must be kept prominently in mind that an individual with syphilis, tuberculosis or both may have cancer of the larynx and vice versa.

The purpose in treatment of cancer of the larynx is to destroy the cancer with its ramifications. The best results probably are to be obtained by the employment of surgery, radiation and diathermy, singly, or with such combinations of these agents as is deemed best in each individual case. If Sir St. Clair Thomson's recommendations are carried out with regard to the selection of cases I think his treatment for intrinsic carcinoma of the larynx is adequate. In those cases, however, in which the disease has progressed beyond the limits laid down by him, in other words in which the disease is no longer intrinsic, many can be at least assured of several additional years of life by laryngectomy and gland dissection with subsequent irradiation.

Dr. V. K. Hart, Charlotte, N. C.—I sometimes wonder if we are not at times inclined to be too pedantic. I cannot quite agree that we can tell the essential character of practically all laryngeal growths by simple appearance. It is true that we may as laryngologists suspect the true nature. Nevertheless, biopsy is most important. In this connection it is important that we send frequent endoscopic specimens to one good pathologist to increase his familiarity with various types of laryngeal pathology. The best interests of the patient frequently demand the opinion of more than one pathologist.

Like Dr. Arbuckle, I have seen cancer of the larynx in a young woman only 27 years of age. Moreover, this was on the posterior third of the cord, and not in the anterior larynx. The diagnosis was confirmed by our consulting pathologist.

Moreover, I have had this experience. A middle-aged woman with multiple papillomatous areas in the extreme anterior larynx, not the posterior for which tuberculosis is supposed to have a predilection, was seen. The Wassermann was negative; x-ray plates showed only a small semi-opaque area in one apex of questionable activity; there was little or no cough; and all sputum examinations were negative. Routine laryngeal biopsy was reported by the pathologist as tuberculosis of the larynx. This diagnosis was confirmed by the subsequent clinical record, because three months later she was in the state tuberculosis sanatorium with a frank chest lesion.

Leukoplakia of the larynx apparently must be viewed as a precancerous lesion. I have an interesting series of microphotographs extending over a two-year period of a male patient in his forties. These show a typical hyperkeratosis of the cords, which is a more accurate term. The lesion can best be described as a symmetrical glistening, studded area on the extreme anterior cords. The patient became symptom-free several times with the use of the actual cautery. Two years later, however, he came in with a fixed left cord and arytenoid diagnosed as malignant and confirmed by the consultant, Dr. Gabriel Tucker, who did a laryngectomy. Unfortunately, the patient died about eighteen months after operation from a recurrence in the pharynx.

I was interested to hear Dr. LeJeune mention the use of the cautery in the treatment of papillomata of the larynx. We have always followed the teaching of Jackson, scalping off at intervals followed by absolute alcohol. I must admit I decannulated one child finally only by the help of the cautery, but I am loth to use it. A useful point brought out today is the use of x-ray therapy as an adjunct to surgery.

Dr. LeJeune (closing).—The pictures just presented to you show clearly the excellent view obtained of the hypopharynx and larynx by means of suspension laryngoscopy. Photography of the larynx is a fairly simple procedure for anyone using suspension laryngoscopy.

The majority of the cases presented here have been operated upon under a general anesthetic. However, two cases were done under local. My preference for general anesthesia is responsible for the fact that it was used in the majority of the cases.

Color photography of the larynx requires a greater degree of illumination and consequently presents greater problems. I now have approximately four hundred feet of normal and pathological pictures of the larynx in colors which I hope to present to you in the near future.

ROCKY MOUNTAIN SPOTTED FEVER INVADES THE EAST*

By JAMES G. CUMMING, M.D., M.S., DR. P.H.,†
Washington, District of Columbia

Rocky Mountain spotted fever, a disease primarily of rodents, may be transmitted to man by the bite of either the wood tick, native to the western mountainous regions, or by the dog tick which is common to the eastern two-thirds of the North American Continent. While the reservoir of the disease in nature is small rodents, from which the tick acquires the virus, it must also be recognized that the virus is transmitted to the young ticks through the egg. Hence we here have a twofold obstacle against successful control.

Our knowledge of tick-borne diseases goes back for over a quarter of a century when, in 1893, Theobald Smith and Kilbourne discovered the transmission of Texas fever by the Texas cattle tick. Smith, as you know, has just been awarded the Copley medal by the Royal Society, Great Britain's oldest scientific organization. While this discovery was of vast economic importance, it also established a new principle in the field of preventive medicine: insect-borne disease transmission.

Since then this group of insects has been incriminated as the carrier or transmitter of the spirochete of relapsing fever in tropical Africa, the spirochete causing spirillosis in fowls of South America, the sporozoan of heart-water sickness of sheep in Cape Colony, the hematozoan of biliary fever among dogs, and in the United States the virus of Colorado fever, tularemia, tick paralysis and Rocky Mountain spotted fever.

Thus it appears that the tick is capable of transmitting a greater variety of diseases in man, animals and fowls than any other insect. Fortunately in man these diseases prevail to only a limited degree due to the life habits of the tick. Those which occur in man, however, are highly fatal.

The experiment of McCalla[1] in 1905 in producing Rocky Mountain spotted fever in two self-sacrificing volunteers by the bite of a tick recently removed from a spotted fever patient indicates the zeal with which medical science has striven to unravel the mystery of spotted fever. King,[2] in 1906, added to our knowledge of spotted fever transmission by producing the disease in guinea pigs through the bite of infected ticks. Ricketts,[3] who made outstanding contributions on the subject and whose life was sacrificed on the altar of insect-borne disease research, reported in 1909 the successful transmission of spotted fever by the Rocky Mountain wood tick and demonstrated the hereditary passage of the virus from one generation of ticks to the next through the egg. Then came the researches of Maver[4] who, in 1911, reported the experimental transmission of the disease by the American dog tick, whose natural habitat is the eastern two-thirds of the American Continent. Only after a lapse of twenty years do we appreciate the importance of this species of tick as a distributor of the infection to man. Dyer, Rumrich and Badger[5] reported in 1931 the transmission of spotted fever, eastern type, by the transfer of blood from a human case to guinea pigs; also the infection of dog ticks through feeding on infected guinea pigs and the transfer of the virus to fresh guinea pigs by the bite of these infected ticks. Furthermore, these investigators reported the transmission of the disease from guinea pigs to monkeys through the agency of the dog tick.

Later they made another outstanding contribution in their demonstration of the transmission of typhus fever in Eastern cities by the rat flea, and distinguished between endemic typhus and Eastern spotted fever both clinically and by cross-immunity tests.

Hence, along the Atlantic Seaboard, we now recognize the existence of two eruptive diseases, purpuric in type and clinically similar, one typhus fever of urban origin transmitted through the agency of the rat flea as well as by the body louse, and the other spotted fever rural in origin and transmitted by the dog tick. These are distinct disease entities both epidemiologically and immunologically.

The physician who studies his patient both clinically and epidemiologically should have no difficulty in arriving at a correct diagnosis and report of the case, which means more complete data as to prevalence.

SYMPTOMS

In our series of 27 cases in Washington covering the last three years, the occurrence of the disease among those under and above sixteen years of age was about equally divided, and its

*Read in Section on Public Health, Southern Medical Association, Twenty-Seventh Annual Meeting, Richmond, Virginia, November 14-17, 1933.

†Chief, Bureau of Preventable Diseases, Department of Health.

MODES OF THE DISTRIBUTION OF SPOTTED FEVER FROM THE ROCKY MOUNTAIN REGIONS TO THE CENTRAL AND EASTERN SECTIONS OF THE UNITED STATES

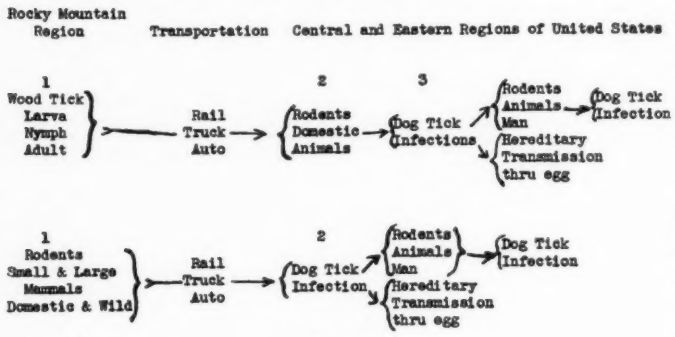

Fig. 1

Diagram indicating modes of transfer of spotted fever virus from place to place by the transportation of either infected ticks or animals.

incidence in males was almost twice that of females. Four of our cases were definitely infected by ticks within the borders of the District of Columbia, and the remainder in rural sections.

In spotted fever the onset is decidedly more abrupt than in typhus fever, and may be ushered in by a chill. There is headache, marked prostration, and generalized aching. In the majority of cases the suddeness and severity of the onset puts the patient to bed, leaving a lasting impression of the exact time of onset.

The temperature reaches its maximum of 103 to 105° F. on the third to the fifth day, is somewhat higher and lasts longer than in typhus, the duration being from fourteen to twenty-one days, and terminating usually by crisis. A continuous fever above 104° F., especially among those over fifty years of age, indicates a bad prognosis.

The increase in the pulse rate is in about the same ratio as that of the temperature. In fatal cases it may reach 150 per minute and even higher.

In spotted fever the rash appears on the third or fourth day, as faint macules first on the wrists and ankles which spread centripetally, including the face. In contrast, in typhus fever the rash appears first on the body and spreads centrifugally. At first, these macules are rose-colored and fade on pressure. From day to day they enlarge and become more abundant, especially on the outer surfaces of the arms and legs, frequently becoming confluent on the wrists and ankles. They petechialize by subcuticular hemorrhage about the tenth day, when they no longer fade on pressure and are distinctly bluish or purple in color, finally fading to a brownish yellow and disappearing in from three to four weeks.

While the nervous symptoms are practically absent in endemic typhus, they may be severe in spotted fever, including stupor, coma, delirium, and aimless picking at the bed clothes. In both diseases there is usually a mild bronchitis with a hacking cough which intensifies the headache, often the patient's most annoying symptom.

In spotted fever there may be edema of the face, hands, feet and scrotum, which may terminate in necrosis, ulceration and scarring. This edema is not a symptom of typhus.

The Weile-Felix test is not specific, but when positive is a diagnostic aid in both diseases, which two alone among the eruptive diseases give a positive Weil-Felix.

SPOTTED FEVER PREVALENCE

The question as to whether or not spotted fever has been recently introduced into the East is of no special importance, yet is a point much under discussion. It may be surmised, however, that if it is of recent introduction the increasing prevalence among ticks will, because of our dense population, result in an increasing prevalence of human cases.

In this connection it may be pointed out that spotted fever is, per 100,000 population, seven times more prevalent in Montana (36 cases) than in the Maryland, District of Columbia, Virginia area (5.5 cases); but it is also true that, per 1,000 square miles, Montana has only one-quarter as many cases as has the Maryland, District of Columbia, Virginia area because in the latter area there is a higher human exposure rate. Even though Montana is considered the home of Rocky Mountain spotted fever, it is significant that owing to the density of population in the Maryland, District of Columbia, Virginia area the incidence of the disease per unit of area is four times greater than in Montana.

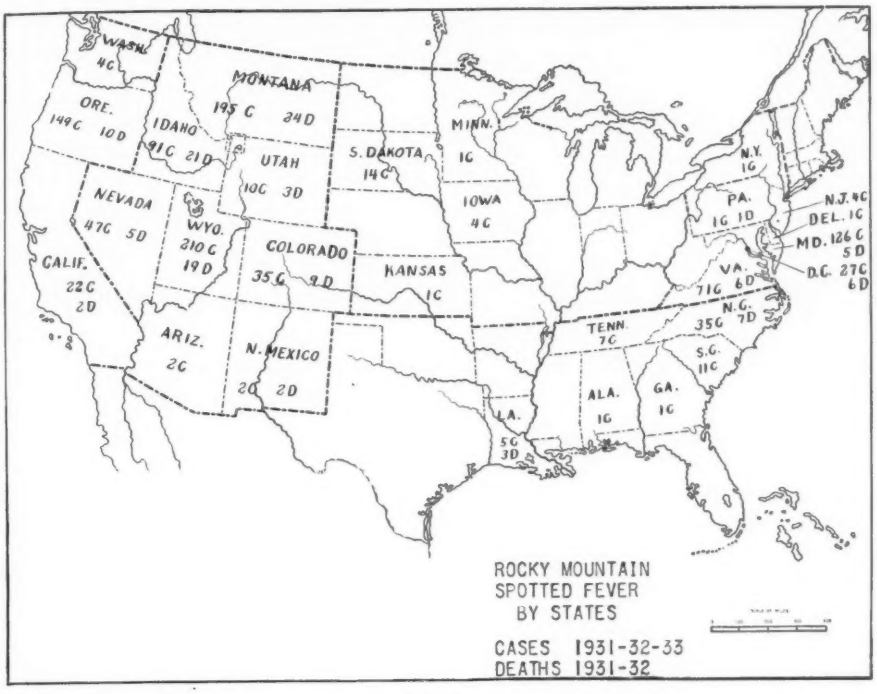

Fig. 2

While the case rate per 100,000 population is seven times greater in Montana than in the Maryland, District of Columbia and Virginia area, there are, per 1,000 square miles, four times more cases in the latter area. The Maryland, District of Columbia and Virginia area appears to be the central focus of infection along the Atlantic Seaboard.

From the above consideration it appears that the interest in spotted fever from a public health point of view may be transferred from its presumably native habitat in Montana to the Atlantic Seaboard states.

In this connection it may be interesting to speculate as to the future prevalence of the disease in the Atlantic states. This whole question is bound up in density of population, human exposure, on the one hand, and on the other the spotted fever carrier rate of ticks in infested regions. The higher the tick carrier rate of the spotted fever virus in infested areas and the greater the concentration of population, the greater will be the prevalence of the disease.

If, for the two areas under consideration, we reduce the incidence of the disease which is primarily due to virus carrier index among ticks, and the concentration of population, to a common factor, that of the rural population per square mile, we find in the Maryland, Virginia area 43 persons per square mile and in Montana 2.4 persons per square mile, or a ratio of 18 to 1. The population in the Maryland, Virginia area is 18 times more concentrated than in Montana. Since the number of cases in the two areas is approximately the same, it would appear that for the period under consideration the spotted fever carrier rate among Montana ticks is 18 times that of those in the Maryland, Virginia area.

Should the tick infection ratio for the two areas remain constant for the next ten or twenty years there should be no increase in human cases along the Atlantic Seaboard. On the other hand, an increase in tick carrier rate in this area will increase human cases.

LIFE HABITS OF THE DOG TICK

Spotted fever in the human being is one of nature's accidents, for ticks are not primarily a parasite of man. Furthermore, the human being is not essential to the perpetuation of this disease, the reservoir of which is wild animals.

Fig. 3
Monkey was inoculated with 5 c. c. of blood from spotted fever patient. Rash well defined. Extensive blood extravasation in tissue of ear.

Recognizing that the dog tick is, in the East, the transmitting agent of the disease, makes the life habits of this parasite of more than usual interest.

The adult female tick deposits on the ground several thousand eggs which hatch into six-legged larvae or "seed" ticks. These larvae climb up near-by vegetation and there await the passing of small mammals as squirrels or mice, to which they attach themselves; after a few days, when fully fed, they drop to the ground, seek a suitably protected place for the moulting period, emerging as the second stage tick or eight-legged nymph. The nymph may or may not gain a host and feed the first summer. If not, it secretes itself in a hiding place and hibernates over the following winter to come up the next spring ready to feed. The nymphs feed on the same species of small rodents as do the larvae. After about a week of feeding, they drop off, hide away for several weeks, then emerge as adult ticks. These also may or may not feed the same summer. The adult insects follow the same general procedure as do the larvae and nymphs. They climb up some weed or grass stalk and, grasping this support with two legs, extend the other six in readiness to cling to the first passing victim, man or animal. Once attached, both male and female feed to repletion, and fertilization takes place on the host animal. Before the resultant death of both insects, however, the female drops to the ground, finds a place to lay her thousands of eggs and thus starts a new generation.

Normally the life cycle of the dog tick is two years, but under extraordinary conditions of food scarcity it may be extended to four years. In other words, the sooner they feed the quicker they die. In fact, metamorphosis from lava to nymph and from nymph to adult and fertilization as well depends on a feed of blood, and the adult insect may live over the third or even the fourth summer awaiting the last meal of blood essential to reproduction.

The Rocky Mountain spotted fever tick is then a "three host" insect, a characteristic which facilitates disease distribution.

THE VIRUS OF ROCKY MOUNTAIN SPOTTED FEVER

Despite the fact that the etiological agent of spotted fever has not been isolated nor grown on artificial media, there is abundant information as to the prevalence of the virus in nature. Singularly enough, the infection of rodents with spotted fever virus is not wholly due to the bite of either the wood or the dog tick, but to other species as well which do not feed on man.

In short, a number of species of the tick are distributors of the virus among the lower animals, while the wood and dog tick carry the infection from these animals to man. But in this connection we must not overlook the researches of Ricketts, who pointed out that the virus has a second line of transmission: this is through the egg to young ticks.

So then we have two sources of virus infection in ticks. One from rodents and other animals and the other by heredity. Of these two, the hereditary source is perhaps the less important because of the thousands of eggs deposited by

Fig. 4
The involvement of the ear resulted in necrosis, ulceration and finally scarring.

Fig. 5

Picture of spotted fever patient taken on eighteenth day of illness. Irregular bluish purple spots on body. Beginning resolution of rash on wrists and ankles as indicated by fading to brownish yellow color.

a single female only about one pair of ticks reach maturity. Therefore, hereditary transmission should play no part in increasing the tick virus carrier rate in successive generations of the insect.

SPOTTED FEVER CONTROL

The danger of tick bite is largely determined by the habitat of the insect and its seasonal prevalence. As has been stated, the disease is usually of rural origin where small rodents, nature's host for the larvae and nymphs as well as the natural reservoir of the virus, may prevail. The tick has a wide range both in the Southern and Northern climates; the period of seasonal activity being comparatively short in the Northern. In the latitude of Pennsylvania the prevalence is June and July. In the Washington area June, July and August, while in the South the active feeding season is of nine months' duration, from March to about November.

Rodent extermination by trapping or poisoning in small and even large areas is stated to be unsatisfactory as a means of tick control because the animals soon return to unoccupied areas. The burning over of areas is also of only temporary value.

In infested localities the immediate measures of protection consist in picking the ticks from the clothing and body at least twice daily. This is expedited by the wearing of light clothing. The attached ticks usually climb upward with the result that they are found on the neck or in the hair on the back of the head. Twice daily picking is important for, strangely enough, the insect cannot transmit the disease for from six to eight hours after starting to feed. During these hours of feeding the freshly drawn blood activates the virus dormant in the tick, whereupon this virus becomes infectious and readily transmissible to the human host. Cooley,[6] of the Montana Agricultural Experiment Station, brings out an interesting phenomenon when he says that there appears to be an anesthetic effect of the bite, so that one does not feel the tick when it is feeding. An individual is always completely surprised when he finds a tick attached.

No reference is found in the literature concerning repellents as a means of avoiding ticks. I have, however, found that the spraying of the shoes and trouser legs with kerosene gives a fair degree of protection. Likewise, it has been my observation that a flock of fowls will keep their foraging area free from the insect. A large flock around a homestead will cover a circle approximately two thousand feet in diameter. Dogs at homesteads so protected harbor comparatively fewer ticks.

The ornithologists tell us that about one-fifth of the food supply of song birds and one-third that of game birds is composed of insects. So bird conservation deserves encouragement not only from sentimental reasons, but as well from the viewpoint of public health.

Mr. W. L. McTee, of the Biological Survey, United States Department of Agriculture, suggests the ridding a lawn from ticks by dragging a sheet over the grass twice weekly during the tick season. The tick, poised to grasp anything that may pass, clings to the sheet, which may thereupon be dropped into gasoline or boiling water.

It is to the indefatigable skill of the United States Public Health Service that we owe our most certain protection against spotted fever. We may pick ticks from the clothing and body, keep fowls, encourage bird conservation, use repellents and drag sheets over lawns, but the vaccine devised by the originality of Dr. R. R. Spencer, of the United States Public Health Service, seems to be the only definite means of protection against mortality.

Handicapped by the fact that the spotted fever virus has not been isolated and cannot be grown in the test tube, Spencer conceived the idea of using nature's host, the tick itself, as the incubator and test tube in the production of large quantities of the virus for immunizing purposes. The infected ticks are permitted to feed on guinea pigs or other animals. The virus is thereby activated and its potency multiplied many thousand times. The gorged ticks are then ground into a carbolized emulsion, which is sedimented for a time, and finally the supernatant clear, rose-colored portion is drawn off and used as the vaccine.

The outstanding record of successful protection against spotted fever mortality by this vaccine may, in the history of vaccine protection, be favorably compared to vaccination against smallpox. Prior to 1925, the research on spotted fever at the Montana Experiment Station was marked by the marytrdom of six investigators. Since that time there have been no deaths among those workers who were fully vaccinated.

The urgent quest for a vaccine was made evident by the fact that in one locality in Montana the disease caused the death of 85 per cent of adults who contracted it. In combating this high mortality by the use of the Spencer vaccine, it is found that among 2,488 persons who received three injections of the vaccine, there were but 8 mild cases and no deaths. On the other hand, in an untreated population of 13,720, there were 29 cases and 24 deaths. While the vaccine does not necessarily protect against the disease, these reports indicate 100 per cent protection against mortality.

Owing to the difficulties and expense in preparing the vaccine, its manufacture will probably be limited to government operated laboratories, and it is doubtful that its use will extend beyond those localities where there is a high tick infestation and a relatively high incidence and mortality from the disease.

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Discussion follows paper of Dr. Milam, page 792.

ROCKY MOUNTAIN SPOTTED FEVER IN NORTH CAROLINA*

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In 1933 there was a rather sudden beginning of reports of cases of Rocky Mountain spotted fever in North Carolina, a state previously without any generally known incidence of this disease. These reports, beginning in early July, continued to come in through September, reaching a total of thirty-seven cases. Previous to 1933 only one case of Rocky Mountain spotted fever had been announced to the State Board of Health. So there is here a rather startling increase in the reported incidence of a very serious disease. This fact lends interest to a statement regarding the present incidence and the background of Rocky Mountain spotted fever in North Carolina.

Early in July, 1933, a member of the Staff of the State Board of Health was called in consultation on a patient in the Piedmont section of the State who was reported as having typhus fever. An investigation brought out the fact that there had been another patient in the same family who had died the day before with symptoms typical of severe Rocky Mountain spotted fever.

CASE REPORTS

Case 1 (*Severe Type*).—A white boy, aged 9 years, fell ill June 28 with malaise and fever. He became progressively worse, his temperature ranging from 102 to 105° F. A rash appeared about the third day of illness, first on the wrists and ankles, then spreading to the abdomen and chest, and becoming generalized in a few days, including his palms, soles, face and scalp. This rash was typhus-like: a diffuse macular rash, not confluent, of a dusky red color at the start. On the seventh day it was definitely petechial in character. Headache was severe and epistaxis occurred on the eighth day. With the onset of delirium the patient sank rapidly and died on July 6, the tenth day of illness. The child lived in a rural community. Three days before the onset of illness an engorged tick was removed from his neck. The Weil-Felix test was positive. No other laboratory work was done. The diagnosis was Rocky Mountain spotted fever.

Case 2 (*Mild Type*).—This patient, aged 7 years, a brother of *Case 1*, fell ill June 23 with malaise, headache and slight fever. The physician first saw this boy six days later, when called to see his brother. Throughout his illness this patient received very scant attention because of the grave illness of the brother. On the sixth day of illness his temperature was 104°

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*From the State Board of Health, Raleigh, North Carolina.

F. A salmon-colored macular rash appeared within the first week of illness and gradually became darker, but was indistinguishable after the first week. The rash started on the flexor surface of the arms and legs and spread to the entire body; it was followed by desquamation in two weeks. Headache was only slight; the pulse was slow. The patient felt well in the morning, with little or no fever, and it was difficult to keep him in bed. His temperature usually began to rise about noon and reached 103° in the afternoon. Recovery was by lysis and was well started in the early part of the third week. About a week before the onset of the illness a tick was picked off the child's head. The Weil-Felix test made on the fourteenth day of illness showed complete agglutination in dilutions 1:640 and partial agglutination in dilution 1:1280. A guinea pig, injected intraperitoneally with 5 c. c. of the patient's blood on the fourteenth day, remained afebrile for seventeen days, and was then found susceptible to Rocky Mountain spotted fever virus. (Since the virus is usually not found in the blood after the tenth day of illness, this negative result was not unexpected.) The diagnosis was Rocky Mountain spotted fever.

Other Cases.—Within ten days from the time these two patients came to notice, two other patients acutely ill with typical symptoms of Rocky Mountain spotted fever were seen, one of whom died. Two reports of deaths from this disease, which occurred in June, were received at this time. Thus, of the first six reported cases coming to the attention of the Health Department, four were fatal. In every instance the representative of the Board of Health saw the patient too lote to infect a guinea pig with the virus from the blood, but in every case the clinical and epidemiological findings fitted in with the usual picture of Rocky Mountain spotted fever. The very high mortality rate was another point in favor of this diagnosis rather than that of endemic typhus. The unforgettable picture of a patient in delirium, or complaining of excruciating headache and pains in the joints and muscles, together with the marked generalized, spotted, typhus-like rash, usually dusky red in color, gave the impression that the disease was unlike anything else seen in communicable disease experience, and it was without reservation accepted as the picture of true Rocky Mountain spotted fever.

In the subsequent weeks there was a sharp lookout for every indication of cases of this disease. An abstract of recent journal literature on the subject was distributed to physicians and several talks were made before county and district medical societies. It was desired to find out how extensive the disease was in this State and whether there had been an increase in the present year, and to map out the areas of maximum incidence. The total of thirty-seven cases, both mild and severe, which were diagnosed by the end of September, were distributed by months as follows, according to date of onset of illness: May two cases, June six, July sixteen, August eleven, September two. Because of the rather intense search for cases, with the follow-up of every clue, a number were turned up after complete recovery, this being particularly true of the milder type of the disease. In every instance, however, the patients were rural people, and in about 60 per cent of cases they gave a definite history of tick bite shortly before the onset of illness.

Clinical Manifestations.—Of the thirty-seven cases, twelve were of the severe clinical type. The remaining ones were of a milder form, but all showed a definite typhus-like rash; and epidemiological factors pointed to Rocky Mountain spotted fever rather than endemic typhus. Parenthetically, it is stated that at the same time many cases, investigated because of positive Weil-Felix report from the State Laboratory of Hygiene, were diagnosed as endemic typhus likewise on epidemiological grounds, since apparently mild cases of the two diseases are frequently clinically indistinguishable. The severe type of case has shown the typical spotted rash covering the entire body, including the extremities, palms and soles, and face, remaining visible well into the third week or longer, and frequently being followed by desquamation. With this type of case the temperature has been high, 105° being frequent and delirium common. Joint pains, extremely severe headache, and prostration have been characteristic. Of twelve patients with this type of disease six died, a mortality of 50 per cent.

It would be unusual for all cases to conform to this severe clinical type. Our experience has shown all gradations in severity down to a mild illness of a few days only. In five instances there were two cases in the same family. In two of the families both cases were mild, and in each of the other three families one patient died while the other had a mild type of the disease and recovered. In the milder form of the disease the rash has not always been generalized, in some instances being absent from the face, palms and soles, in some being confined chiefly to the trunk. This type of rash usually did not develop a petechial form and it characteristically disappeared within one week. Thus, clinically the disease frequently resembled endemic typhus, but epidemiologically Rocky Mountain spotted fever was indicated. The chief epidemiological factors considered were: rural or urban

residence, history of tick bite or of mashing dog ticks, or of living on premises infested with rats.

Including the milder type of case, the fatality rate in the thirty-seven cases was 16 per cent, about what would be expected in the Eastern type of Rocky Mountain spotted fever.

Geographical Distribution.—It is worthy of mention that all but four of our cases were living in the Piedmont section of the State; over 60 per cent of them being located in four adjacent counties. Within these counties the cases were all grouped in a very few areas, this apparently supporting the observation that foci of infected ticks are likely to be of very limited extent. In each of two counties four cases in separate houses were within one-half mile of each other. In two other counties there were two foci for twelve cases, one of these foci being common to both counties and overlapping the county line.

Age, Color and Sex.—There is apparently no age, color or sex immunity. In our series cases occurred in every age group from infancy to old age, with, of course, preponderance in the middle age groups. There were eight females, and there was one negro.

Occupation and Residence.—Our patients included sixteen farmers and four farmers' wives; ten school children and four pre-school children; and three laborers. All but three were rural dwellers and those three had abundant rural contacts.

Laboratory Tests.—The certain diagnosis of Rocky Mountain spotted fever rests on laboratory proof alone. The immunity test furnished certain diagnosis in the first series of studies of this disease, which was made in the eastern United States by officers of the United States Public Health Service. This test requires the transmission of the virus to a laboratory animal, usually the guinea pig, whence it is available for carrying through the procedures on immune and non-immune animals. The usual procedure in field work is to inject a guinea pig intraperitoneally with 5 c. c. of patient's blood immediately after drawing. It has been demonstrated that the virus usually disappears from the peripheral blood from the eighth to the twelfth day of the disease. In our State the patient has usually been seen for the first time subsequent to this period, so that this immunity test could not be successfully carried out. But in several instances we have been able to send injected guinea pigs to the National Institute of Health for immunity tests. Several guinea pigs and rabbits injected locally have not yielded results satisfactory from a diagnostic standpoint.

At no time did we feel any doubt as to the diagnosis in our severe cases, even though it was made only on clinical and epidemiological grounds. In the milder type of case also the diagnosis seemed quite definite on clinical and epidemiological grounds alone, but laboratory proof was urgently needed in a few cases at least. Of three guinea pigs, injected with patients' blood and reported on by the National Institute of Health, one developed no symptoms, but was subsequently found to be immune to the virus of Rocky Mountain spotted fever. This result was labeled "inconclusive." From a second guinea pig the virus was transferred to a group of new pigs, but was then lost in this second generation. This result was labeled "unsatisfactory," and illustrates the difficulties surrounding this procedure.

In the third guinea pig a clear-cut "positive" was obtained, the report reading as follows:

"We have to report that we succeeded in establishing a strain of virus in other guinea pigs by inoculating them with blood from the guinea pig sent by you. This strain of virus was found to be Rocky Mountain spotted fever virus."

The patient with whose blood this guinea pig was infected had a very mild type of infection; the fever did not rise above 103°, and the rash, which first appeared on the neck and chest, was of a macular type that never became petechial and lasted only ten days. The patient made a splendid recovery without any unusual features. This clear-cut positive on a very mild case was of great help to us in insisting that the mild form of the disease we have been seeing in North Carolina is true Rocky Mountain spotted fever. It was just here that we stood most in need of laboratory confirmation. I wish at this time to express our great appreciation for the ready help extended to us by Dr. McCoy and his colleagues of the National Institute of Health in carrying out this very essential laboratory work.

Another laboratory test, from which we hoped to get much help, is the neutralization test made by injecting animals with a mixture of convalescent serum of the suspected patient and known virus of Rocky Mountain spotted fever. This test has seemed to offer a method of confirmation more adaptable to our field conditions. The protective substance in the blood of a patient convalescent from Rocky Mountain spotted fever decreases very rapidly after the onset of convalescence, and it has therefore been our aim

to get these blood specimens for testing within one month from the onset of the disease. These sera have been sent to the National Institute of Health in Washington, where a supply of the Rocky Mountain spotted fever virus is kept available. Of six such blood specimens sent to the National Institute of Health, four from patients whose illness was diagnosed as endemic typhus and two from patients for whom the diagnosis was doubtful but whose condition showed some features suggestive of Rocky Mountain spotted fever, all were reported as showing no neutralization for Rocky Mountain spotted fever virus. Our experience with this test is very scant. A widespread use of it should be made both in North Carolina and in other Southern states.

DISCUSSION

Previous Incidence.—Rocky Mountain spotted fever was made reportable in North Carolina in 1932, following the announcement of Badger *et alia* in February, 1931, that an Eastern type of the disease had been proven to exist in the Chesapeake Bay region. It is interesting to record that several physicians in North Carolina had been reporting cases of this disease to county medical societies for two or three years prior to 1931, but very little credence had been given their diagnosis by their colleagues. Their descriptions were accepted as diagnostic of typhus fever, a disease assumed to have existed in the State for many years (though this had been shown by Maxcy and others to be endemic typhus or Brill's disease). A few physicians, however, were unwilling to accept a diagnosis of "typhus fever" for the cases they were seeing, since epidemiologically these differed from typhus fever (European) in several important points, notably that the patients were not infested with lice, and were rural people, usually in good economic circumstances and with no possible suggestion of overcrowding, such as is characteristic of groups in which outbreaks of typhus fever occur in Europe. Their cases occurred only in the warm months of the year, while typhus is usually a winter disease. Rather, these patients were ill with what fitted in with the description of Rocky Mountain spotted fever, except for the fact that the disease occurred not in Montana, but in North Carolina, where Rocky Mountain spotted fever was assumed not to exist. These physicians were not surprised when careful laboratory work proved that their clinical diagnosis was reasonable and that Rocky Mountain spotted fever could and did exist in the eastern United States. At least five physicians who have practiced in North Carolina for twenty years or more give definite statements of having seen cases as long as twenty years ago, in which the symptoms and epidemiological factors were the same as in the cases we have been seeing this year.

The model state-wide vital statistics law in North Carolina went into effect in 1914. Reported deaths from typhus fever since that time, by years, are as follows:

Year	No. of Typhus Fever Deaths	County	
1919	2		
1927	1	Mecklenburg	
1929	1	Randolph	
1930	6	Mecklenburg	1
		Nash	1
		Wake	1
		Randolph	3
1931	3	Mecklenburg	2
		Guilford	1
1932	3	Alamance	1
		Wake	1
		Orange	1
Total	16		

Deaths from European typhus in North Carolina would be a matter of great interest, and up to the present time these deaths reported as due to typhus have been assumed to be endemic typhus. In line with our most recent experience it is worth considering whether these deaths may not in part have been due to Rocky Mountain spotted fever. Their distribution largely coincides with the area where Rocky Mountain spotted fever has been most prevalent this past summer.

Incidence of Endemic Typhus (Reported Cases).—From 1929 to 1932 a total of fifty-seven cases of endemic typhus was reported to the State Board of Health (including those reported as typhus). In the present year to November 1, a total of thirty-one cases has been reported. By years the reported incidence was:

ENDEMIC TYPHUS

Year	No. Cases
1929	3
1930	16
1931	14
1932	24
1933 (to Nov. 1)	31
For five years	88

Geographically, these cases were located chiefly in the Piedmont section from Mecklenburg to Vance Counties, and in a focus on the coast at New Bern. Ten cases each were in Craven, Randolph and Mecklenburg Counties. In 1933, incidence has been greatest in the coast cities of Wilmington and New Bern, with scattered cases in the same Piedmont group of counties. It is noteworthy, however, that in

Randolph County in 1933, six cases of Rocky Mountain spotted fever have been diagnosed, but not one case of endemic typhus, this being a county in which formerly endemic typhus was most prevalent. Cases of typhus-like fever, occurring in former years in Randolph County and called by some "Randolph fever," now seem in retrospect perhaps true Rocky Mountain spotted fever. It would seem that in several areas cases formerly diagnosed as typhus fever would now unhesitatingly be called Rocky Mountain spotted fever.

There is undoubtedly a very definite incidence of true endemic typhus fever in North Carolina. Urban cases are reported from the cities of Wilmington, New Bern and Charlotte, and other foci undoubtedly exist. But the rather prevalent rural typhus, occurring chiefly in the Piedmont section, is always under question by us as possibly being Rocky Mountain spotted fever.

Regarding the true incidence of endemic typhus the experience at Wilmington is in point. Previous to 1933, only one case of endemic typhus was reported from that city. However, it was at Wilmington that Maxcy secured one of his strains of endemic typhus virus in 1928. The disease has been prevalent there for many years, estimated by the City Health Officer at ten to twenty cases yearly from 1920 to 1930, all urban. However, in the list of diseases reportable to the State Board of Health, typhus was included, but not endemic typhus as a separate disease, and this health officer refused to let these cases be reported as typhus, since they were really endemic typhus, an entirely different disease. So they went unreported. Therefore, statistics in North Carolina are evidently quite incomplete for the true incidence of endemic typhus. In 1932 both endemic typhus and Rocky Mountain spotted fever were placed on the list of reportable diseases. The present year is the first one in which actual reported cases of Rocky Mountain spotted fever have assumed any importance.

SUMMARY

(1) Report is made on thirty-seven cases of Rocky Mountain spotted fever occurring in North Carolina in the summer of 1933.

(2) Two types of cases were diagnosed, one severe (12 cases) and the other mild (25 cases), all rural; 60 per cent gave a history of tick bite. The severe type conformed to the clinical picture of Rocky Mountain spotted fever, while the milder type was frequently clinically suggestive of endemic typhus, though epidemiological facts pointed to Rocky Mountain spotted fever.

(3) Laboratory confirmation is incomplete, but has been suggestive of Rocky Mountain spotted fever. From one mild case the virus of Rocky Mountain spotted fever was isolated.

(4) A discussion of reported cases and deaths from typhus fever in North Carolina is included, together with facts suggestive of the presence of Rocky Mountain spotted fever in North Carolina for at least twenty years.

DISCUSSION (*Abstract*)

Papers of Dr. Cumming and Dr. Milam

Dr. William Litterer, Nashville, Tenn.—In all probability this disease has existed east of the Appalacian Mountains for the past twenty years. Last year more than 150 cases were reported in the Southeastern and Southern states. Although the great majority of the cases have not been confirmed by immunologic procedures and animal tests, still the clinical histories and symptoms are so typical that there is little doubt as to the correct diagnosis. Of the extreme Southern states, only Texas and Tennessee have confirmed most of their cases by animal inoculations and immunological procedures. Last year we reported six cases in Tennessee and this year five cases. All were worked out by laboratory methods. The first recognized case of the Eastern type of Rocky Mountain spotted fever made its appearance in Tennessee on May 30, 1931, in a small town with a population of about 3,000. The second case appeared nine days later in the same family. These two patients, ages five and seven years, brother and sister, lived in the heart of the residential section of the city and had not been out of the city for more than six months. Strong evidence suggests that at least these two cases of the disease were introduced from Helena, Montana, by means of fox hounds. Investigation showed that the fox hounds came from an endemic area of Rocky Mountain spotted fever, several human cases having been reported in the immediate vicinity whence the fox hounds came. The hounds were allowed to roam at will in the surrounding country. One hound was shipped from the neighborhood one year prior to the onset of symptoms of the first case. The second hound arrived six weeks before the onset of symptoms, while the third hound came one week before the onset of illness. These fox hounds were kept next door to the cases and the children (cases) often played with them. The hounds had access to a very deep lot or back yard heavily grown up with underbrush, making an ideal place for the propagation of ticks. According to authorities, ticks may stay on dogs as long as ten days before dropping off. Since only two or three days are required in transportation

from Helena, it is easily possible that the hounds introduced infected ticks into Tennessee.

Dr. C. L. Outland, Richmond, Va.—In 1927 we had in this city several cases reported as typhus fever which, as I see it now, might have been the Rocky Mountain spotted type. Two cases of the fulminating type resulted in death. Both patients came from out of the city. One was brought here for treatment and died, autopsy was performed and the diagnosis confirmed. There were four others, all of whom had been out of the city for some time or were brought in for hospitalization. In each case we found bites from some insect such as a tick or flea. In one case several leeches had been removed from the child's body and another patient had been bitten by a pet squirrel.

When Dr. Maxcey, of the University, definitely proved fleas to be vectors, we found that several cases gave a history of numerous flea bites. This was previous to his report.

Dr. F. C. Bishopp, Washington, D. C.—It is very probable that here in the East, as well as in the West, the common rabbit tick (*Haemaphysalis leporis-palustris*) may play an important role by carrying the disease from host to host among the wild animals. This tick is rather abundant and very widely distributed in the East. Fortunately, it does not attack man.

Dr. Cumming mentioned the season for the American dog tick (*Dermacentor variabilis*) as being June to August, inclusive. The United States Bureau of Entomology has records of its occurrence in the vicinity of Washington, District of Columbia, as early as the latter part of March, and the tick often becomes rather numerous by the middle of May.

It might be well to mention the danger of picking ticks off dogs or crushing such ticks. Infection may be contracted in this way. We are therefore suggesting the use of forceps to pull the ticks off, or the application to the ticky dog of an insecticide, such as powdered derris root, to destroy the ticks; also the thorough washing of the hands after handling ticks or ticky dogs.

Since vaccine can be supplied for but a small percentage of those exposed, the importance of preventing tick attachment and of reducing the number of ticks in areas near habitations and camps should be stressed.

In order to make case records of most value the ticks removed should be accurately identified whenever possible. I shall be glad to supply prompt identifications of specimens submitted to me at the Bureau of Entomology, Washington, District of Columbia.

Dr. Milam (closing).—The Weil-Felix test, with one exception, was positive whenever it was made. We do not consider this test of importance in the differentiation of Rocky Mountain spotted fever and endemic typhus, but only to determine the presence of rickettsial infection. Our tests were made with proteus X_{19} only. In several instances the test was not made when cooperation on the part of the patient after recovery was not very good. The single instance of a negative Weil-Felix test has puzzled us, since the patient had a very typical course and supporting epidemiological history.

THE COMMONER FORMS OF ARTHRITIS*

By Wm. H. Higgins, M.D.,
Richmond, Virginia

In this afternoon's clinic I am bringing to you for your consideration a discussion of one of the diseases most frequently seen in your practice, as well as one of the most baffling from the standpoint of treatment.

The term arthritis includes a group of clinical syndromes as varied in their manifestations as are the etiological factors underlying them. Until the more recent decades all forms of joint involvement were considered as more or less related to the same unknown cause. During the past few years, however, a very substantial progress has been made in the understanding of this disease in its various ramifications.

In the time allotted to this discussion I wish to present certain salient points about some of the more common types of arthritis with which you are familiar. In order to simplify this presentation it is desirable to arrange the subject in some sort of working classification. The accompanying outline serves this purpose and is based on Cecil's concept of the disease.

CLASSIFICATION OF ARTHRITIS

(I) *Acute Arthritis*
- (a) Infectious
  - (1) Rheumatic fever
  - (2) Septic arthritis
    - (a) Gonococcal arthritis
    - (b) Pneumococcal arthritis
    - (c) Suppurative arthritis (staphylococcus, *Streptococcus hemolyticus*)
    - (d) Other less common forms of acute bacterial infection of the joints.
- (b) Non-infectious
  - (1) Allergic arthritis (serum sickness)
  - (2) Intermittent hydrarthrosis
  - (3) Acute traumatic arthritis

(II) *Chronic Arthritis*
- (a) Infectious arthritis
  - (1) Specific arthritis
    - (a) Syphilitic arthritis
    - (b) Tuberculous arthritis
  - (2) Chronic infectious arthritis (atrophic)
    - (a) Arthritis deformans
    - (b) Still's disease

*Read in General Clinical Session, Southern Medical Association, Twenty-Seventh Annual Meeting, Richmond, Virginia, November 14-17, 1933.

(b) Degenerative arthritis (osteo-arthritis, hypertrophic)
  (1) Heberden's nodes
  (2) Arthritis of the menopause
  (3) Morbus coxae senilis
  (4) Senile arthritis
(c) Metabolic arthritis (gout)
(d) Mixed forms of chronic arthritis
(e) Spondylitis

The etiology of rheumatic fever has always been shrouded in mystery. Although its infectious origin has been generally accepted, the type of organism and its modus operandi are still in doubt. It was more or less generally assumed that the clinical picture was due to the localization of certain strains of streptococci in the joints and other parts of the body which gave rise to the typical manifestations. The fact, however, that positive cultures can only rarely be procured from the joint exudate has made the theory of an actual bacterial invasion of the joints improbable. Recent studies have shown that certain streptococci seem to produce a hyper-sensitiveness to these organisms and that the joint manifestations are apparently an allergic response to these bacteria. The work of Swift and his associates has led to the theory that

"Any kind of streptococcus capable of causing a local infection may produce a state of excitation, allergy or hyperergy in the tissues of a susceptible host, and while the tissues of this host are still in a hyperergic state, further infection of its tissues with any streptococcus or its toxin may produce a more or less marked reaction."

A specific treatment for rheumatic fever has never been developed for the very good reason that no one strain of organism has actually been identified in these cases. Small, of Philadelphia, has isolated an indifferent streptococcus from which he has made a serum. His work has not been generally accepted, although his own reports have been encouraging. We, therefore, still rely on the old empirical line of therapy with especial emphasis on prolonged rest in order to protect the heart from further damage.

Under the heading of acute infectious arthritis we include gonorrheal arthritis. Our chief concern in the management of this disease is the avoidance of a permanent ankylosis from adhesions. Porter, of the Medical College of Virginia, conceived the idea that if some method could be devised by which the synovial membranes can be prevented from adhering to one another, much of our difficulty would be overcome. He, therefore, recommended the injection of air directly into the joint which has proven satisfactory in 39 out of 40 cases. I am presenting to you today a young man who entered Memorial Hospital three weeks ago suffering with an acute specific urethritis and a painful swollen right knee. He has had four air injections and will be given his last injection in your presence by one of the interns. With the usual aseptic precautions, an aspirating needle attached to a 50 c. c. syringe is introduced under a local anesthetic into the joint cavity. You will notice that about 30 c. c. of yellowish fluid is withdrawn, after which 75 to 100 c. c. of air is injected. After three or four days the air will have been absorbed, but the patient will experience considerable relief and no opportunity will have been afforded for adhesions.

The pathology of gonorrheal arthritis fits in admirably with the air injection treatment. There is at first, as you know, a leukocytic reaction about the joint followed by granulations over the synovial membrane. In some instances there is also an involvement of the cartilages. There is a tendency in the more severe types of infection for a generalized fibrosis to form within the joint, producing dense adhesions, which in turn create an ankylosis. By the method described above, this is apparently to a large extent eliminated. The beneficial effect of the injected air may be due not only to its mechanical separation of the synovial membranes, but also to the fact that nitrogen inhibits the growth of gonococci and its presence in the joint may serve in this capacity.

Passing over the other less common types of acute arthritic infections, I would like to emphasize certain points in the differentiation and treatment of the chronic non-specific arthritides as listed in the foregoing classification. Although the nomenclature of these chronic joint infections is in dispute, there is now some consensus of opinion in separating these forms into:

(a) Chronic infectious arthritis, sometimes known as chronic atrophic or rheumatoid arthritis, and

(b) Chronic degenerative arthritis, sometimes designated as hypertrophic or osteo-arthritis.

Evidence is accumulating to indicate that the chronic atrophic or rheumatoid arthritis is of bacterial origin. Although laboratory studies in different institutions have not paralleled each other as to any one specific organism, yet it is generally agreed that one or more strains of streptococcus are possibly the exciting factor.

Cecil, in a large group of cases, was able to isolate a streptococcus from the blood stream of 67 per cent of his series. Other workers have not been able to secure this high percentage of positive cultures. Of greater significance, however, has been the finding of an agglutinating substance for certain strains of streptococcus in the blood from these cases. It would seem from this observation that a practical method has been found which serves to differentiate those types of arthritis which are dependent on a streptococcus.

This chronic type of atrophic arthritis generally occurs in the fourth and fifth decades in contrast to the hypertrophic form which is more prone to develop after the age of fifty. The typical lesion is a fusiform swelling around one of the mid-phalangeal joints, which is brought about by a proliferation of the synovial membrane, later involving the bony structures with the production of marked deformity. The larger joints may also become affected, but the fingers are the most frequent sites. For reasons that are difficult to explain there are apparently certain predisposing etiological factors which occur with sufficient frequency to be of significance. For instance, a severe shock, either mental or physical, may be followed by the development of an arthritis. A death in the family, a difficult accouchement, a surgical operation or some business calamity seems in some way to precipitate this malady. Fatigue, trauma, repeated exposure to dampness and changes in temperature are frequent incidents in the history of these patients.

The treatment of chronic atrophic arthritis has provoked the most intense interest in recent years. Vaccine enthusiasts have pitted their wits against advocates of protein shock, sulphur derivatives, dietary and mechano-therapeutic agents. Obviously with such an array of therapeutic endeavors, it is impossible to obtain a unanimity of opinion on the management of this type of arthritis. Last year Miller presented before this Association an appraisal of the value of vaccines based on a questionnaire covering this method of treatment. According to his report, 66 per cent of the replies favored the use of vaccines. Some expressed a preference for the administration of streptococci recovered from the intestine, although the majority preferred autogenous vaccines made from cultures recovered from active foci of infection. My own experience has been limited to the use of vaccines made from cultures of streptococci which were agglutinated by the patient's blood. Following Cecil's technic, minute doses are given intravenously at five- to seven-day intervals in increasing amounts, but not sufficient to produce a reaction. Although the results in my series have been far from satisfactory, not infrequently a brilliant response is obtained when other methods have failed. It is needless to add that the removal of foci of infection, a balanced diet, ample rest and other upbuilding measures should form the background for whatever other line of treatment may be elected.

The chronic hypertrophic arthritis presents a somewhat different picture. It is probably not bacterial in origin. In contrast to the atrophic types, the pathology begins in the bony structures or the cartilages and later involves the synovial membranes. A lipping of the bones is produced, but not a true ankylosis. The sites most commonly affected are the terminal phalangeal joints, knees, and vertebrae. Probably the most important predisposing factor in the etiology is age, as it occurs almost exclusively in middle aged and elderly people. Next to age the most important contributory factor is trauma. These two underlying causes are aggravated by overweight, faulty posture and occupation. Cecil has shown that in his series of such cases at the Cornell Clinic the average weight was 182 pounds. Faulty posture places an unnatural strain on the joints and seemingly encourages the bony proliferation.

The harmful effects of certain types of occupations are readily shown by the appearance of hypertrophic changes in those joints which bear the brunt of some particular trade. Laundresses, for example, are particularly prone to develop Heberden's nodes.

The treatment of chronic hypertrophic arthritis is notoriously unsatisfactory, although some degree of comfort may be given. The present feeling is that focal infection probably plays no part, and it is not seriously considered in the general management of the case.

The fact that this type of arthritis is frequently associated with evidences of an endocrine dysfunction has led many to the use of thyroid extract which has proven a useful adjunct in the treatment. In order to relieve the strain on the weight-bearing joints it is essential that there be a drastic reduction in weight and, therefore, a low caloric diet is advocated. Pemberton had felt that many cases have a low

sugar tolerance and are helped by a reduction in the carbohydrates.

Fortunately the prognosis is distinctly better than it is for the atrophic form, since it is unusual for a complete ankylosis or other deformities to follow in the wake of hypertrophic arthritis.

Medical Arts Building

THE BIOLOGIC ACTION OF RADIANT ENERGY: ULTRAVIOLET*

By EUGENE R. WHITMORE, M.D.,
Washington, District of Columbia

In my studies on malaria I was interested to find that ultraviolet radiation would cause relapse in bird malaria, though all of the energy is absorbed in the skin; and this led me to a further study of the effect of ultraviolet radiation on the body.

Levy found that mice exposed to ultraviolet radiation uniformly showed marked changes in the internal organs, though there were no changes in the exposed shaved skin. Gassul made similar studies of the action of ultraviolet radiation on mice and found the same changes in the internal organs as had been reported by Levy.

I repeated the work of Levy and Gassul, and found marked and progressive inflammatory changes in the shaved skin of mice irradiated with an efficient quartz-mercury arc lamp; and such mice were killed by a dose (computed on time and distance) above five times the dose that caused a mild second degree erythema of the skin of my forearm. I did not find any progressive changes in the internal organs of such mice as had been reported by Levy and Gassul.

That work also showed that mice are not suitable for such studies, on account of the great amount of "normal pathology" (lung abscess, and so on) in the control mice. This work, when compared with that of Levy and Gassul, showed the necessity of careful measurement of the dosage daily; distance from the lamp and time of exposure not being sufficient to determine the dosage. In that work, I checked the energy output of the lamp by testing its effect on an area of the skin of my forearm.

In the report of that work, I suggested that the extent of the area exposed is also a factor; and proposed to repeat the work, using guinea pigs, and using such checks as had been suggested by the previous work.

MEASURING THE ENERGY OUTPUT OF QUARTZ-MERCURY ARC LAMPS

Christian says that in physical therapy the dosage is the amount of energy.

Quartz-mercury arc lamps vary greatly in energy output, and deteriorate with use; so, even with constant energy input, the energy output is increasingly inefficient, especially with reference to the ultraviolet component. So, it is necessary to measure the energy output more carefully than by distance and time.

(1) A simple practical method is by determining the time necessary to produce an erythema on an area of the skin of the forearm. But the skin of different persons reacts differently to the dosage of ultraviolet, due especially to varying amounts of pigment in the skin; so the results of different workers cannot be compared.

(2) It may be measured by the darkening of lithopone paint; blackening of various substances; fluorescent uranium glass, and so on.

(3) By radiometers, as the thermopile and galvanometer.

(4) With Gordon's ultraviolet meter it is possible to make a quantitative determination of the ultraviolet radiation falling on a given area in a given time. The instrument is plugged into the ordinary light source and aimed at the ultraviolet source at the desired distance. By turning the rheostat knob, a comparison lamp in the instrument is made to show equal intensity with the fluorescent light coming through a slotted disc from the ultraviolet source; and the milliameter is read. Reference to a calibration table gives the intensity of ultraviolet radiation in ergs per square millimeter per second.

I am now using Gordon's ultraviolet meter, and this enables me to take into consideration the extent of the surface exposed, as I had suggested in my earlier work. It also enables different workers to compare the dosage used in the form of total energy in the form of ultraviolet radiation.

*Read in Section on Pathology, Southern Medical Association, Twenty-Seventh Annual Meeting, Richmond, Virginia, November 14-17, 1933.

PRESENT WORK

The guinea pig has not been extensively used in studies of the action of ultraviolet radiation. Baumann studied guinea pigs, with special reference to the action of ultraviolet radiation on the white blood cells. He got no results with unshaved pigs, but when he radiated the shaved backs of pigs he got inflammatory changes in the exposed skin and changes in the white blood cells. Some of the pigs died, but he found no cause of death. He noted that light colored pigs were less resistant to the radiation than were dark colored pigs. Jansen also studied the skin changes in guinea pigs exposed to ultraviolet radiation and found a typical inflammatory reaction in the skin.

I have irradiated a number of white guinea pigs, exposing increasingly large areas of shaved skin and measuring the dosage with the Gordon ultraviolet meter. In this work I have found the guinea pig much more resistant to ultraviolet radiation than is the mouse. Without going into detail, the largest dose I have given was to a 230 gram pig, with the hair removed from the body between the shoulders and the hips (about two-thirds of the skin surface). This pig was given a dose of 189 joules of ultraviolet radiation daily for five days, the dose being divided equally between the dorsal and ventral surfaces of the body at each exposure. (After five days, the new growth of hair and the epidermal crusting on the inflamed area protect the pig from further action of the ultraviolet). The skin of the abdomen was quite markedly inflamed, the skin of the back much less so. The pigs were kept warm and carefully fed; and, even in the case of this pig which received the heaviest dosage, the pig was not inconvenienced, was not sick at any time, and ate regularly. To give an idea of how this dosage compares with the dosage that killed mice: this dosage (computed on distance and time), at each dose, divided between the abdomen and the back, is twenty times that which caused an erythema of the skin of my forearm, or four times the dosage that killed mice. This resistance of the guinea pig to ultraviolet radiation, together with our knowledge of the "normal pathology" in guinea pigs, makes the pig a satisfactory animal for such studies.

I next considered rabbits for this work. I find relatively little on the use of rabbits in these studies. Ziegler, using medium sized albino rabbits, studied the reaction in the skin of the ear after ultraviolet radiation; Jansen also studied the local reaction in the rabbit's ear after ultraviolet irradiation. Both found inflammation.

I used albino rabbits, with the hair removed from the abdomen; and exposed them to ultraviolet radiation over this area daily for five days. Again, without going into detail, a rabbit weighing 2.5 kilograms was given 367 joules of ultraviolet radiation over the shaved abdomen daily for five days. There was quite marked inflammation of the exposed skin, but the animal was not inconvenienced, was not sick, and continued to eat normally. This work indicates that the rabbit is a suitable animal for this work. Its relatively large size and the ease with which blood examinations can be made on it are advantages in the rabbit.

HOW DOES ULTRAVIOLET RADIATION ACT?

There are various theories, some of them rather fantastic.

(1) *Heat.*—It has been held that the ultraviolet radiation is absorbed in the superficial portions of the skin and is converted to heat; the resultant changes being due to this heat. We do know, as shown by Wittek, that heat will cause pigmentation of the skin, but not so markedly as does ultraviolet radiation. Heat also causes the same type of gross changes, inflammation, in the skin as does ultraviolet radiation, but the changes due to heat appear very promptly, while those due to ultraviolet radiation do not appear for some hours. The thermopile shows relatively little energy in the form of heat on absorption of ultraviolet radiation, but the chemical changes produced by ultraviolet radiation are very marked. Finally, if an area is exposed to ultraviolet radiation, with a piece of glass between the lamp and the exposed area, the area may actually become warmer than when no glass is placed over it; but there are no changes of the nature of those due to ultraviolet radiation, because the ultraviolet is absorbed by the glass and does not reach the exposed area.

(2) Rollier suggested that short wave radiant energy, as ultraviolet, is transformed to longer waves, which penetrate or are carried to a distance, there to exert their effect. He suggested that the pigment in the skin acts as a transformer of these waves. The use of albino animals practically excludes the disturbing factor of pigment, yet it is well known that ultraviolet radiation produces a marked reaction in albino animals.

(3) The effect on the calcium and phosphorus balance, with viamin D appearing in the picture,

has been extensively studied, and is pretty well understood.

(4) Considerable attention has been paid to discussion of the action of ultraviolet radiation on atomic or electronic structure.

(5) There has been considerable discussion of the effects of ultraviolet radiation in oxidation and reduction; and Gottschalk and Nonnenbruch found that ultraviolet radiation increases cell oxidation.

(6) Formation of substances in the inflamed skin, which are carried through the body in the blood, has been suggested. Aschoff says that the chemical rays cause the classical symptoms of inflammation in the skin. Ziegler says that the general reaction following ultraviolet irradiation depends on the skin reaction, but is not parallel with it; and that the reaction is like that of a variable foreign protein on the blood. In my work on mice I ran a series of experiments with peptone injections, but the results were inconclusive.

COMMENT

Earlier work failed to confirm previous findings of progressive changes in the internal organs of mice exposed to an efficient quartz-mercury arc lamp, but did show marked changes in the exposed skin of such mice. This work also showed that mice are not suited for such studies; and it showed the necessity of careful measurement of the dose of ultraviolet radiation, probably of all ultraviolet radiation falling on the exposed surface. The Gordon ultraviolet meter is suitable for this measurement.

Studies of guinea pigs and rabbits, measuring the ultraviolet radiation falling on different sized areas of shaved skin in these animals, show both the guinea pig and the rabbit to be more resistant to ultraviolet radiation than is the mouse, and show both of these animals to be suitable for such studies.

As to how ultraviolet radiation acts on the body, it is agreed that it causes typical inflammation in the exposed skin. As to the general body reaction, it is probable that the effects of ultraviolet radiation are produced in more than one of the ways that have been suggested.

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DISCUSSION (*Abstract*)

Dr. J. A. McIntosh, Memphis, Tenn.—Does the pigment in the skin interfere in any way?

Dr. F. C. Hodges, Huntington, West Va.—Have you any idea what is the cause of death in the irradiated animals?

Dr. Whitmore (closing).—Rollier suggested that the pigment in the skin acted as a transformer for the radiant energy. In using white mice and white rabbits, we are dealing with albinos, so there is no pigment in the skin to interfere. While there is no strain of albino guinea pigs, by using white pigs with pink eyes, there is small probability of interference from pigment in the skin, especially for the few days of exposure to radiation.

Baumann says he did not find any cause of death in his pigs that died soon after irradiation. In the mice that die after several days of irradiation, no cause of death is found at necropsy; apparently death is due to the same causes as after any other severe burn.

NEPHRITIS COMPLICATING IMPETIGO*

By LEE E. SUTTON, JR., M.D.,
Richmond, Virginia

Recently it has been brought to our attention that acute nephritis with impetigo has appeared too frequently not to be commented upon. Within the last two years several severe cases have been admitted to our wards. Abstracts of some of them are as follows:

Case 1, History S 1799.—Irene J., aged three years, a colored female, was admitted to St. Philip Hospital on October 3, 1931, with a generalized eruption and swelling of the face, legs, and ankles. On September 28, five days before admission, her mother noticed a generalized eruption on the patient, who complained

*Read in General Clinical Session, Southern Medical Association, Twenty-Seventh Annual Meeting, Richmond, Virginia, November 14-17, 1933.

also of itching. On October 1, her mother noticed swelling of the patient's legs and arms, which increased during the late afternoon and early night. Apparently there had been no hematuria or dysuria. The patient had been constipated during this illness, and the mother stated that this was unusual; also that the stools had been a greenish color rather than their usual yellow.

There was a past history of frequent head colds; otherwise negative.

Except for the fact that the mother had had nephritis in 1930, the family history was negative.

Physical examination on admission showed a ring worm lesion 2 cm. in diameter in the scalp; over face, arms and legs an eruption of an impetiginous character of the crusting type. Many of the lesions contained a small amount of pus. There was a slight pallor of the mucous membranes of the mouth and conjunctivae. The tonsils were even with the pillars and very slightly injected. The posterior cervical and occipital lymph nodes were very slightly enlarged. The nose and ears were negative. There was a moderate Harrison's groove. Heart and lungs were negative. No masses were felt in the abdomen and the spleen was not palpated; no fluid wave or costovertebral tenderness was elicited. The umbilicus was slightly herniated. There was a generalized edema of the face, slight edema of the trunk, and moderate edema of the lower extremities. Only the ankles showed pitting. The skin over this area was shiny. There was no abnormal pigmentation of the skin or joint swelling. Reflexes were normal. A slight vaginal discharge was present.

Laboratory findings on admission were as follows: the urine showed a slight trace of albumin, and was negative for acetone, sugar, and diacetic acid. Many red blood cells, many hyaline and granular casts, frequent pus cells, and a few epithelial cells were seen in the sediment.

The blood showed 80 per cent hemoglobin with a count of 4,050,000 red blood cells per cu. mm.; the white blood cell count was 12,400 per cu. mm.; the differential count showed 65 per cent polymorphonuclears, 34 per cent lymphocytes, and 1 per cent eosinophils.

No blood chemical studies were made.

Routine throat culture showed non-hemolytic streptococci and *Staphylococcus albus*.

A vaginal smear showed occasional pus cells, no gram-negative intracellular diplococci, frequent gram-negative bacilli, and gram-positive cocci in pairs.

On October 6, 1931, the eruption was much improved. The patient's fluid intake was increased, as all edema had disappeared.

On October 9, the patient's eruption was clearing up nicely on body and scalp. The urine had cleared up except for a few pus cells.

On October 19, the patient had continued to improve and the eruption had healed. The urine showed many pus cells in clumps, which diminished in number until she was discharged.

During hospitalization, the patient's temperature varied from 100° F. on admission to 98 and 99° F. Pulse and respiration were essentially normal.

She was discharged on November 3, 1931, with the following diagnoses: impetigo, acute nephritis, non-gonorrheal vaginitis, and tinea of scalp.

Case 2, History 12254.—Jonathan B., a three-year-old colored male, was admitted to St. Philip Hospital on April 9, 1933. The parents gave a history that in February, two months prior to admission, the child had suffered from a watery, vesicular eruption which later became crusted. It first appeared on the hands, later on the legs, and then on the buttocks. He was treated for this at the clinic, but he never became free of lesions. On the morning preceding admission to the hospital, the father noticed that the child was swollen around the eyes, and also over the legs and abdomen. No difference had been noticed in his eating, sleeping, or playing until this time, when he lost his appetite, became restless and did not want to play.

The patient had had a past history of impetigo during his first two summers, lasting about two months on each occasion. He had measles at the age of two and pertussis at two and a half.

The family history was essentially negative.

Physical examination on admission showed the patient to be uncomfortable, but not acutely ill. He was well developed and nourished. There was edema of the face, especially around the eyes, and over the thorax. Respirations were increased and shallow, but not accompanied by grunts or apparent pain. Scattered impetiginous, crusty lesions were present over the body, especially over the scalp, buttocks, and legs. Individual lesions varied in size from 1 to 2 cm. in diameter. The tongue was coated. The tonsils extended just beyond the anterior pillars, and both pillars and tonsils showed a slight redness. There was no nasal discharge and the ears were negative. The abdomen was distended and tympanitic. No fluid wave was present and no masses were felt. Heart and lungs were negative. Reflexes were present.

Urine examination on admission showed the presence of one plus albumin, no sugar, a trace of diacetic acid, no bile. The sediment showed 8 to 9 white blood cells per high power field, 1 to 2 red blood cells per high power field, many phosphate crystals, a few epithelial cells, and no casts.

The blood count on April 10 showed 10,450 white blood cells per cu. mm., with a differential consisting of 59 per cent polymorphonuclears, 31 per cent lymphocytes, and 1 per cent endothelials. The red blood cell count was 3,700,000 per cu. mm. with 75 per cent hemoglobin.

Blood chemical examination on April 11 showed 80 mg. of sugar per 100 c. c., 48 mg. of nonprotein nitrogen, 538 mg. of chloride, 126 mg. of cholesterol, and total proteins 6 per cent, albumin 3.7 per cent, and globulin 2.3 per cent.

After nine days' stay in the hospital, edema had disappeared and the impetigo was clearing up. The urine was entirely negative. The temperature was 100° F. for one day and the pulse 120 to 130 per minute, but they soon became normal. The respiration was at one time 50 per minute, but returned to 30 in two days.

The patient was discharged April 25, 1933, with the diagnoses of impetigo and acute nephritis.

Case 3, History 13615.—Eunice J., a three-year-old white child, was admitted to Dooley Hospital on June 15, 1933. There was a history of eczema and impetigo for the last three summers. The patient had never had any other sicknesses or diseases until seven days before admission, when she acquired a cough and her

urine became scant and dark red in color. She complained of pain in the abdomen and her face began to swell. Four days prior to admission the swelling began to appear over the whole body, and the patient became fretful and lost her appetite. She had taken nothing on the day of admission except water. The bowels were regular.

The past history and family history were essentially negative.

Physical examination on admission revealed the following: the patient lying in bed showed an increased respiration of about 40 per minute, each respiration accompanied by a grunt, giving the appearance of a fairly sick child. There was a slight generalized subcutaneous edema with swelling of the eyelids. The eyes and ears were essentially negative. There was a slight crusting of the nose. The tonsils were present and even with the pillars. Both showed slight redness. The teeth were negative. There was no cervical adenopathy. Extremities and scalp showed many crusting impetiginous lesions. The abdomen was slightly distended and voluntarily tense. The liver border was 3 cm. below the costal border in the nipple line and the spleen 1 cm. below the costal border. The lungs seemed negative. The heart rate was rapid, 160 to 130 per minute. Otherwise the heart was negative. The blood pressure was 140/100 mm. of mercury. The patient was irritable, crying, and moderately sick, but not prostrated.

Laboratory findings on admission revealed the following: the urine showed four plus albumin, was negative for sugar, acetone, and diacetic acid. Many granular and hyaline casts, and a few red and white blood cells were present in the sediment.

The blood showed 15,300 white b'ood cells per cu. mm. with a differential count of 80 per cent polymorphonuclears, 19 per cent lymphocytes, and 1 per cent eosinophils.

The blood chemical analysis showed 34 mg. of nonprotein nitrogen per 100 c. c., 518 mg. of chloride, and the total proteins to be 6 per cent, the albumin 4.2 per cent, and the globulin 2.2 per cent.

During her stay in the hospital, the temperature ranged between 101 and 98° F. Edema had disappeared by June 23, eight days after admission, and by June 24 the urine was normal and the impetigo healed. The patient appeared to be perfectly well at this time.

The patient was discharged on July 1, 1933, with the diagnoses of impetigo and acute nephritis.

Case 4.—Hattie L., an eight-year-old colored female, was admitted to St. Philip Hospital on July 18, 1933, complaining that two weeks previous to admission she had noticed swelling of her feet and ankles, accompanied by some fever, but no nausea or vomiting. Prior to the onset of swelling of the feet, the patient had had an eruption described as impetigo of undetermined duration. The day before admission the patient's face and abdomen became swollen.

There was a negative history of any acute infections such as scarlet fever, colds, or sore throat. The patient had had measles, pertussis and diphtheria several years previously. Otherwise, the past history was negative.

The family history was negative.

Physical examination showed a well developed and nourished patient who seemed moderately sick, with marked edema of face, legs, and feet. There was moderate abdominal distention, with a shifting dullness and some tenderness in both lower quadrants. No spasm or masses were felt. Axillary and cervical lymph nodes were shotty in character. Ears, nose and throat were negative. Legs and feet showed active, crusting, impetiginous lesions about 1-2 cm. in diameter. The reflexes were present. Blood pressure was 190/115 mm. of mercury, temperature 99.4° F.; pulse and respiration were normal.

Urine on admission showed a four plus albumin and was negative for sugar, acetone, and diacetic acid. Numerous red blood cells, casts, and pus were present in the sediment.

Blood findings on admission showed 14,300 white blood cells per cu. mm. with a differential count of 82 per cent polymorphonuclears, 15 per cent lymphocytes, 1 per cent eosinophils, and 2 per cent basophils. The red blood cells were 3,760,000 per cu. mm. with 75 per cent hemoglobin.

Blood chemical analysis on admission showed 75 mg. of sugar, 48 mg. of nonprotein nitrogen, 252 mg. of cholesterol, 5.6 per cent total protein, 3 per cent albumin, and 2.6 per cent globulin.

After admission the temperature ranged from 100 to 99° F. The blood pressure fell gradually until it was 130/75 mm. of mercury by the ninth day and it has ranged around that since.

Edema had disappeared by August 17, one month after admission, and has not reappeared. The patient has felt well since one week after admission, with no complaints whatsoever. She weighed 50 pounds on admission and her weight fluctuated until the middle of September. She then began to gain and now weighs 61 pounds. No focus of possible infection has been found other than impetigo. X-ray of the sinuses showed them clear except for slight clouding in the region of the ethmoids on the right, not marked and not indicative of active change. During the course of the disease the patient had three flare-ups, accompanied by macroscopic blood and a heavy trace of albumin, lasting two to three days, unaccompanied by increase in blood pressure, fever, or edema.

On November 13, 1933, the urine contained a heavy trace of albumin. The sediment showed rare cellular and granular casts, many red blood cells, an occasional white blood cell, and a few epithelial cells. Otherwise, the urine was negative.

Blood examination showed 6,500 leukocytes per cu. mm., with 58 per cent polymorphonuclears, 34 per cent lymphocytes, 2 per cent eosinophils, 4 per cent endothelials, and 2 per cent myelocytes. The red blood count was 4,160,000 per cu. mm. A hemoglobin of 70 per cent was present.

The blood chemistry showed 26 mg. of nonprotein nitrogen, 428 mg. of cholesterol and 406 mg. of chloride per 100 c. c. of blood; and 6.2 per cent total proteins, which consisted of 3.6 per cent albumin, 2.6 per cent globulin.

The patient is still in the hospital, as she is not considered well enough to be discharged. Her physical examination is negative.

The diagnoses were impetigo, acute nephritis, and sinusitis (?).

Case 5, History 16374.—Norman B., a four-year-old colored male, was admitted to St. Philip Hospital on October 16, 1933, with a history of good health until

the onset of the present illness, October 1. On the latter date, the mother noticed that the patient had developed crusting sores over the lower extremities, which later appeared over the body. These lesions itched and contained some pus. Eight days later the patient developed edema of the ankles and face, and the abdomen appeared swollen. The patient lost his appetite and had pain on voiding. The urine was a dark red color. He also had slight transient headaches.

He had had no infectious diseases, no noticeable bad colds or sore throat. The family history was negative.

Physical examination showed a fairly well developed and nourished four-year-old male child with numerous scabetic and impetiginous lesions (crusting) scattered over the entire body except the face. The impetiginous lesions were deep and contained a good deal of pus. The patient did not appear acutely ill. There was edema of the face and lower extremities and slight edema over the trunk. A slight shifting dullness was present. The ears and nose were negative. The tonsils were extended slightly beyond the anterior pillars, were cryptic and slightly reddened. The cervical and inguinal lymph nodes were the size of shot peas. The lungs, heart and the rest of the body were negative. Temperature, pulse and respiration were normal.

The urine on admission showed a two plus albumin and was negative for sugar, acetone and diacetic acid. The sediment showed 5 to 6 white blood cells and 2 to 3 red blood cells per high power field.

Blood examination on admission revealed 16,100 white blood cells per cu. mm. with a differential count of 50 per cent polymorphonuclears, 4 per cent large, and 44 per cent lymphocytes, 1 per cent eosinophils and 1 per cent endothelials. The red blood cell count was 3,800,000 per cu. mm. and the hemoglobin was 75 per cent.

Blood chemical analysis on October 19, 1933, showed 200 mg. of cholesterol, 32.2 mg. of nonprotein nitrogen, 407 mg. of chloride per 100 c. c. of blood, and 6.6 per cent total protein, which consisted of 3.2 per cent albumin and 3.4 per cent globulin.

The temperature was 101° F. on entrance; the next day it was normal and remained so throughout the course. The pulse and respiration were normal. X-rays of the sinuses were negative. The edema was gone by October 24. The blood pressure remained within normal limits. The impetigo and scabies were cured by October 28.

On October 30, 1933, the blood showed 13,500 white cells, with a differential count of 69 per cent polymorphonuclears, 28 per cent lymphocytes, 1 per cent eosinophils, and 2 per cent endothelials. The red blood count was 4,390,000 cells per cu. mm., and the hemoglobin 75 per cent.

On November 2, 1933, the urine was negative except that the sediment showed a rare red blood cell and 1 to 2 white blood cells per high power field.

On November 10, the urine was clear.

The patient was discharged on November 11, 1933, with the diagnoses of scabies, impetigo, and acute nephritis.

The five cases just reviewed suggest that impetigo may have been the etiological agent of nephritis. Nephritis did not occur in any of these cases until the impetigo had been established and the impetiginous symptoms were the only ones complained of at the time of the beginning of the nephritis. It cannot be said definitely that there was no other cause of the nephritis, such as a focus of infection in the tonsils or the sinuses, which may have existed in some of the cases.

During the period in which these five cases were admitted to the hospital, thirteen other cases were diagnosed as acute nephritis, in which tonsillitis or some other condition was considered the etiological agent.

Acute nephritis in children is usually attributed to infections. Whether it is due to bacteria which act directly on the kidney or their toxins carried there by the blood stream has not been definitely determined.

Hill[1] reports that any acute infectious disease in a child may cause nephritis, but that tonsillitis is the most important of these, scarlet fever probably being next.

Miller[2] says that the cause of acute nephritis is most often a streptococcus from the upper respiratory tract, especially from the tonsils or sinuses.

Allison[3] reports that twelve cases of acute nephritis in children who ranged in age from 4 to 11 years, were investigated in an attempt to discover the etiological factor, and that two-thirds of these cases at the time of onset of acute illness showed markedly enlarged tonsils and adenoids, which were in a state of chronic inflammation. From the results after removal of these it can hardly be doubted that the tonsils and adenoids were the etiological factors.

Clausen[4] says that in a series comprising all cases of parenchymatous nephritis seen at the St. Louis Children's Hospital in a period of three years, nasal sinusitis was invariably present. Evidence was presented that indicated that the sinus infection was an important factor in the causation of the disease.

Longcope,[5] et al., report that in 85 per cent of forty cases of acute or subacute glomerular nephritis, the onset was preceded or accompanied by an acute infection such as tonsillitis, sinusitis, bronchopneumonia or scarlet fever.

Text-books usually give at the end of a group of infections listed as the cause of acute nephritis, skin infections, including impetigo. Although impetigo is listed as a cause of acute nephritis, we hear very little about it.

These five cases of acute nephritis, accompanied by impetigo, which have occurred within

two years' time and which comprise 28 per cent of the nephritic cases admitted to our clinic during this period, are here reported for the purpose of stressing the fact that impetigo, or the so-called "dew-boils" infection, which is frequent in the South, should not be taken lightly. This disease may be followed by complications.

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THE TREATMENT OF NEVUS VASCULARIS*

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A subject dealing with a condition that is as old as life itself is not presented without some misgivings. Two years ago, we had the privilege of hearing our Chairman, Dr. Glaze, discuss the technic of x-ray administration for skin therapy, bringing to light a number of practical ideas. With such a plan in mind, I am going to discuss the treatment of vascular nevi.

It is my intention to take up this problem of nevi according to their classification, and to consider the methods of treatment commonly used; also, to endeavor to add some particular points of interest by presenting a few special cases.

Various authors classify vascular nevi somewhat differently, but in order to clarify this discussion the following nomenclature will be employed:

(1) Capillary or port-wine nevi.
(2) Strawberry nevi.
(3) Cavernous hemangioma.
(4) Spider nevi (nevus araneus).

(1) *Port-wine Nevi.*—The histopathology of the port-wine nevi shows a dilatation and overgrowth of the capillary blood vessels, the majority of the vessels being of venous structure and situated in the lower layers of the epidermis and upper layers of the dermis. On clinical inspection, the lesions are red to purple in color, single or multiple in number, and vary in size from a fraction of a centimeter to an area covering the entire side of the face. Radium, carbon dioxide snow and ultraviolet ray are the three physical agents most commonly employed for treatment. I have used radium in a number of cases and it has been my experience that the lesions do not respond satisfactorily, especially when they are larger in size than 1 cm., as is usually the case. As a result, most cases will give a mottled appearance from radiation, which is undesirable. To obtain a complete disappearance of the red or purple discoloration, radiation to the point of atrophy is frequently necessary. Such a result is far from desirable.

Carbon dioxide snow likewise fails to give satisfactory results in these perfectly flat, port-wine marks. Ultraviolet ray, especially by the Kromayer lamp (water-cooled type) has been advocated by some dermatologists, but has given unsatisfactory results in my hands. Green,[2] of Kansas City, has treated many cases by this method and secured very good results by using heroic doses. Andrews[3] has obtained satisfactory results in certain types of these birthmarks with the air-cooled ultraviolet ray, by which he believes that a more homogeneous radiation can be delivered. He likewise insists on a blistering dose.

As a general thing, it seems far better to leave these intractable port-wine nevi alone than to brand the patient with the tell-tale marks of the experimenting dermatologist.

(2) *Strawberry Nevi.*—The histopathology[1] of these lesions reveals a meshwork and an overgrowth of dilated blood vessels arising from the deeper layers of the dermis and subcutaneous tissue.

The treatment of strawberry marks is usually confined to radium and carbon dioxide snow. In using radium, there is naturally a great difference of opinion as to proper screening and dosage employed by various workers. I adhere to the principle of using thin filters for thin lesions and thicker filters for thicker lesions. In those lesions which are from 0.5 to 2 mm. in depth, a 10 mg. radium plaque is applied, carefully shielding the normal surrounding tissue. A filter of 0.1 to 0.5 mm. of aluminum is used from ten to twenty-five minutes, the time being varied in direct proportion to the filter (MacKee technic[4]). Filtering of this degree takes advantage of the beta rays. Such a treatment is not repeated for at least six to eight weeks. Every effort is made to treat effectively, but an erythema dose is carefully avoided. From two to four applications are made, and six to fifteen months' time is required to obtain desirable re-

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sults. By meticulous care and avoidance of an erythematous reaction, evidence of atrophy or telangiectasia may usually be avoided. Strawberry marks, of course, are often thicker than 2 mm.; in fact, they may be as much as 15 mm. in depth. In those lesions which are approximately 7 to 15 mm. in thickness, all of the beta rays should be eliminated by filtering the 10 mg. radium plaque through 2 mm. of brass, or its equivalent. This filtering is necessary by virtue of the fact that the beta rays are absorbed to such a degree by 7 mm. of tissue that beyond this depth they are deprived of any potent effect. Gamma rays become necessary to treat effectively tissue thicker than 7 mm. Also, the radium is placed from 7 to 12 mm. above the lesion. The purpose of placing the applicator above the surface of the skin is to overcome the disproportion of the skin and the depth dose, thereby causing the gamma rays to act on the blood vessels within and saving the tolerance of the skin. The 10 mg. plaque is allowed to remain from eight to twelve hours, the time varying in direct proportion to the thickness of the filter and the depth of the lesion. It is best not to exceed three-fourths of an erythema dose with such filtering and distance at any application in moderately deep lesions.

Carbon dioxide snow is very valuable in certain strawberry nevi and should be used when indicated. Lesions as thick as 6 to 8 mm. frequently can be obliterated, but beyond that point its value lessens rapidly. In lesions thicker than 6 to 8 mm. the refrigeration causes a fibrosis in the vessels of the upper one-half or three-fourths, leaving the lower stratum of vessels untouched and producing an incomplete result, thereby allowing an excellent opportunity for further development of the nevus. Considerable experience and observation of many cases is necessary in order to determine the correct amount of pressure in applying the snow, and how long it should be held in contact with the skin. It should be kept well in mind that atrophy and scarring follow in over-refrigeration; hence, the apparent ease of the technic of refrigeration should not give a false security. In certain instances a combination of radiation and freezing works admirably, but always the freezing should be used last in order to avoid the necessity for the rays to pass through tissue that has been fibrosed by refrigeration, which requires increased radiation at the expense of the skin.

(3) *Cavernous Hemangiomata.*—These are usually lesions in which brilliant results can be obtained, as it is apparent that the endothelial cells lining the arterioles, venules and sinuses are more nearly embryonic in character and thereby are especially sensitive to radiation. Experience has shown that in younger infants all vascular nevi respond much better than in older children, and especially adult patients, thus indicating the difference of the radiosensitivity of the intima cells at different ages. A brief review of the histological picture reveals that cavernous hemangiomata are composed of large masses of newly formed and enlarged blood vessels, sinuses, and intercommunicating blood spaces extending deeply into the subcutaneous tissues. Veins, capillaries and arteries enter into this histological picture.[5]

Clinical types vary considerably in these unsightly lesions, thereby altering the technic of treatment accordingly. Among the different varieties most commonly seen is the type which has a large, soft, compressible tumor upon which is superimposed either a port-wine mark, a strawberry mark, normal white skin, or any combination of these lesions. Extensive denudation with an annoying exudation may complicate the picture and add greatly to the problem of making satisfactory dressings by the parents. Rather deep necrosis with hemorrhage is alarming to the family; infection or trauma may occur and in some instances spontaneous resolution of the nevus occasionally occurs. Necrosis incidentally following radiation always causes the parents to be apprehensive as to its cause, and frequently they are too ready to blame radiation unjustly.

One essential and preliminary step in treating cavernous hemangiomata is to advise the parents of the fact that treatment requires from one to five years, depending on the case at hand.

Nothing but gamma rays should be utilized in these lesions. Not only should 2 mm. of brass be used to eliminate all beta rays, but, also, 1 to 2 mm. of lead is employed to preserve the tolerance of the skin, carefully taking into consideration the future treatments that may be necessary in very thick lesions. The source of radiation is placed at 2.5 cm. from the skin, which is still another method of filtering, and also adds to the homogeneous quality of the rays; moreover, in some instances where a single source of radiation is utilized on a lesion of rather large dimensions, a distance of 2.5 cm. results in a more uniform radiation intensity in all parts of the lesion.

The amount of radium used varies according to the size of the lesion to be treated. A smaller lesion that will be effectively covered by the rays coming from a single source can be satisfactorily exposed to a 50 mg. tube using such screening and distance as above noted. In case the lesion covers an area of 3 x 5 cm. or greater, it is advisable to have smaller sources of radium more equally distributed over a part or, if possible, the entire lesion. Multiple 10 mg. plaques or 10 or 12.5 mg. needles distributed in a manner to give a more uniform spread of rays is most desirable. With such a "set-up" most cases of this type are treated from twenty to twenty-four hours of continuous radiation, and the amount of the radium varies from 50 to 200 mg., depending on the extent of the surface to be covered. With such treatment the dosage varies from 1,000 to 4,800 mg. hours. To be more specific, it may be stated that each area containing 2 cm. square is given approximately 240 mg. hours. In case the physician has less than 40 mg. of radium in 10 mg. plaques, he is compelled to move the applicators from place to place on the nevus, thereby adding to the technicalities of correct distribution and dosage. No erythema results from such a treatment and this is a feature that should be strictly observed. An interval of two or three months should be allowed before another radium application is made, using the same careful precautions and possibly lessening the dose if deemed advisable. If a third treatment is necessary it is not given for three to eight months after the second. If a fourth application is made, from six to eighteen months are allowed to elapse. The reason such intervals are observed is because of the fact that radium produces an obliterative endarteritis that may continue many months after it has been given; hence, a conservative plan is necessary to avoid a cumulative effect and the sequelae resulting therefrom.

Some men have utilized interstitial radiation in certain hemangiomata with excellent results, but I have not employed this method on account of fear of necrosis incident to treatment with steel filtered needles and too high a concentration of radium therein. There are no platinum screened needles or gold radon seeds available in my locality. Also, it may be said that the principles of radiation treatment employed in this paper are necessarily in accord with radium in variable quantities available in certain applicators, which is undoubtedly the case with many other dermatologists not located in large medical centers.

Fibro-hemangiomata are encountered in a small number of cases and the increased presence of this admixture of fibrous tissue with the vascular tissue helps to explain why certain cases do not offer as complete nor as rapid results as the average hemangioma.

In those cavernous hemangiomata having strawberry marks superimposed, it is well to wait until a later time to treat the superficial lesions. Incident to the radiation for the deeper portion, the superficial lesions usually improve very much or may entirely disappear. In case radiation fails to obtain the desired results superficially, refrigeration with carbon dioxide snow frequently clears the remaining blemish.

Certain cases of nevi offer a good surgical removal, but due to the extremely vascular nature of most lesions and their connection with the larger blood vessels, surgery is often dangerous or impossible.

I have had no experience with the injection of boiling water into the tissues and therefore cannot discuss its merits.

(4) Spider nevi have been treated by several methods, according to the particular dermatologist. It has always been my preference to desiccate the central punctum of the radiating capillaries with the Oudin current. In the majority of instances, one treatment obliterates the lesion; however, the remainder can be desiccated later if necessary.

SUMMARY AND CONCLUSIONS

(1) Various methods of treatment for vascular nevi are discussed. In the majority of such lesions satisfactory results can be obtained.

(2) Such treatment requires the attention of the dermatologist or radiologist who has a thorough knowledge of radiotherapy if unfortunate sequelae are to be avoided and the best results obtained.

(3) All physicians practicing obstetrics or pediatrics should have a practical and intelligent knowledge of vascular nevi, thereby enabling them to have their cases so afflicted treated correctly and early in infancy by qualified physicians.

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DISCUSSION (*Abstract*)

Dr. Eastland (closing).—With Dr. Tyler's reference to the interstitial use of radium in large, cavernous angiomata I agree almost entirely. Many of the cases that come under my care are seen in a state hospital, where no arrangement is made for the provision of radon seeds. Likewise, in private practice many patients are the children of people who have suffered heavily in the depression, making it impossible for them to have sufficient ready cash to pay for the emanation. Moreover, by the careful technic used in dosage and screening, as delineated in the paper, it is amazing what satisfactory results can be obtained by external radiation.

GUNSHOT WOUNDS OF THE ABDOMEN*

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Gunshot wounds of the abdomen are of particular interest to surgeons in the South, for, as Dr. Haggard has said, we live below the "Smith and Wesson line" and have a far greater number of these injuries than any other section of the country. They comprise quite a large percentage of the emergency abdominal surgical cases admitted to our charity hospitals.

In 1873, Dr. Hunter McGuire read a paper before the Virginia Medical Society in which he advanced the underlying principles which are still followed in the treatment of gunshot wounds of the abdomen. Following the more general acceptance of this method of treatment, there was a marked reduction of mortality in these cases. Since this time there has been a great deal written on this subject, but the mortality for gunshot wounds of the abdomen in civil life remains around 50 per cent.

In reviewing the literature the lowest mortality rate I have found was published by Guerry[1] in 1915. He reported 27 penetrating gunshot wounds of the abdomen with only three deaths. McKeithen[2] reported 66 cases operated upon with a mortality of 44.6 per cent. Miller[3] reported 46 cases with a mortality of 50 per cent. Billings and Walking[4] reviewed 136 cases of gunshot wounds of the abdomen from the records of the Pennsylvania Hospital during the years 1909 to 1930, inclusive, reporting a mortality of 55.14 per cent. Willis[5] reports 63 cases with a mortality of 35 per cent. Loria,[6] in 1930, reported 112 cases with a mortality of 60.7 per cent. Heuer[7] reported 202 gunshot wounds of the abdomen with a mortality of 50.9 per cent. Martin[8] reports a mortality of 62.77 per cent in 113 cases.

This paper is based on the study of 289 cases of gunshot wounds of the abdomen, 283 cases treated in the Hillman Hospital from January, 1926, to January, 1933, with a few cases in the first few months of 1933, and six cases from my private practice treated at St. Vincent's Hospital. The Hillman Hospital cases were admitted on the services of Dr. J. M. Mason, Dr. D. F. Talley and Dr. D. S. Moore, and I am much indebted to them for the privilege of making this report. The operations at the Hillman Hospital were performed by the attending, assistant attending members of the staff and the resident surgeon.

The youngest case in this series was 7 years of age and the oldest 59. Seventy per cent were between the ages of 17 and 35. They were mostly robust individuals in the prime of life and would ordinarily be classed as excellent surgical risks. Two hundred and thirty-eight were colored and fifty-one white, the colored outnumbering the whites practically five to one. There were 137 recoveries and 152 deaths, giving a mortality of 52.5 per cent. Twenty-four were in such moribund condition on admission that no operation could be attempted. There were 10 cases which recovered without operation, 2 of which had definite penetrating abdominal wounds and 8 with non-penetrating wounds, giving an operative mortality of 50 per cent.

In this series there were 17 shotgun wounds. Twelve were operated upon with three recoveries. Two cases recovered without operation. In one of these many shot could be seen in the abdominal cavity with stereoscopic roentgenograms, the other case recovering without operation evidently had no penetrating wounds, giving a mortality in this group of 70.6 per cent and an operative mortality of 75 per cent.

There were 55 cases of combined abdominal and chest wounds with 13 recoveries and 42 deaths, giving a mortality in this group of 76.36 per cent.

It is very apparent that the two main causes of death in gunshot wounds of the abdomen are, first, extensive hemorrhage associated with shock; and second, peritonitis. It seems to me that the only way we can hope to reduce our

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Table 1

		Recovered	Died
Pistol and rifle wounds	272	132	140
Shotgun wounds	17	5	12
Total gunshot	289	137	152
Cases operated upon	255	127	128
Cases not operated upon	34	10	24

Table 2

TYPES OF VISCERAL INJURY IN CASES OPERATED UPON

	Recovered	Died
Combined abdominal and chest wounds	13	42
Gallbladder	1	3
Pancreas	1	4
Spleen	1	4
Liver	20	29
Kidneys	4	10
Ovarian cyst	1	0
Uterus	3	0
Stomach	13	34
Duodenum	0	3
Small intestine	41	67
Large intestine	30	49
Bladder	4	6
Aorta	0	1
Internal iliac artery	0	1
Spinal cord	0	5

Table 3

CAUSES OF DEATH

	Cases	Per Cent
Hemorrhage with associated shock	89	58.5
Peritonitis	47	31
Intestinal obstruction	7	
Pneumonia (empyema 1)	5	10.5
Gas bacillus infection	3	
Gangrene of the intestine	1	

mortality rate in this type of injury is by improving our methods of combating hemorrhage and by preventing general peritonitis. Of the two causes of death, hemorrhage accounts for 58.5 per cent and peritonitis for 31 per cent, or almost twice as many die from the effect of hemorrhage as from peritonitis.

The most effective treatment of hemorrhage and its associated shock is first to arrest the hemorrhage; and, second, to replace the blood lost by giving transfusions. Adequate treatment of hemorrhage in these cases has long been recognized as our greatest hope in reducing the present high mortality rate. Mason,[9] in papers published in 1922 and 1924, especially emphasized the importance of transfusions in penetrating wounds of the abdomen. Since then practically every author on this subject has stressed this point. Loria,[10] in 1932, published a very extensive paper on "The Influence of Hemorrhage in Abdominal Gunshot Injuries." I have classified this series according to the classification of Mason, dividing them into the large and small hemorrhage group.

Table 4

CLASSIFICATION ACCORDING TO HEMORRHAGE

Large Hemorrhage Group	Cases	Died	Mortality Per Cent
(a) Cases not operated upon because of collapse from hemorrhage on admission	24	24	100
(b) Operative cases with large hemorrhage and extensive visceral injury	95	73	73.6
Total	119	97	81.5
Small Hemorrhage Group			
(a) Operative cases, with no material hemorrhage but extensive visceral injury	139	54	38.8
(b) Exploration with non-penetrating wounds or penetrating with no visceral injury	21	1	4.7
Total	160	55	33.4

There were only 26 transfusions given in the entire 289 cases. Twenty-four were given in the large hemorrhage group, all of which were operated upon with 10 recoveries and 14 deaths, giving a mortality in this group of 58.3 per cent. The 10 cases that recovered had large hemorrhage with extensive visceral injury. The operative mortality on patients in this group not transfused was 80.8 per cent. Therefore, it seems that we can with the aid of transfusion hope to reduce the mortality in this group at least 20 per cent.

Autopsy records could be found on only 20 of the 128 operative deaths. In checking the autopsy findings against findings at operation I was very much surprised to find that in 10 cases visceral injuries had been overlooked at the time of operation. This is a considerably higher percentage of overlooked injuries than were reported by Billings and Walking, who found only 9 cases of overlooked injuries in 45 autopsies. In *Case 1* a perforation of the sigmoid and internal iliac artery were overlooked. This patient was transfused, but died fifteen days after operation from infection. In *Case 2* a perforation of the duodenum and transverse mesocolon were overlooked. The patient died in 41 hours from loss of blood and gas bacillus infection. In *Case 3* a perforation of the small intestine was overlooked and death occurred in 20 days from peritonitis and intestinal obstruction. In *Case 4* a perforation of the stomach was overlooked and the patient died of shock and hemorrhage with complicated chest injuries. In *Case 5* a perforation of the tail of the pancreas and spleen were overlooked. The patient died in 4 days from intestinal obstruction and localized peritonitis in the region of the pancreas and spleen. In *Case 6* a wound of the kidney was overlooked and the patient died from shock and hemorrhage due to a chest

wound. In *Case 7*, with large hemorrhage, a perforation of the small intestine was overlooked and the patient died from hemorrhage in 14 hours. In *Case 8* a perforation of the stomach was overlooked, the patient had severe hemorrhage from a wound in the colon, spinal cord and lung. This patient died in 27½ hours. In *Case 9* two perforations of the stomach and one of the spleen were overlooked. This patient also had chest wounds and died from empyema and diaphragmatic peritonitis 9 days after operation. In *Case 10* a perforation of the ascending colon was overlooked and the patient died from peritonitis 12 days after operation.

Of these 10 cases it is possible that 5 or at least 4 might have lived had all the visceral injuries been found and properly treated at the time of operation. The number of autopsies is so small that it is impossible to say whether or not this high percentage of overlooked injuries would have prevailed throughout the series. However, I am convinced that they account for a large number of deaths in the group which died from general peritonitis. Anyone who has had experience in operating upon these injuries can appreciate how easily this error may be committed. Most of the patients were in a critical condition at the time of operation and the operator could not be so careful in his search for perforations as he would have been had the patients' condition been more favorable. Here again by the use of transfusion the patient's condition might be so improved that a more deliberate search for perforations and other visceral injuries could be carried out.

In two cases which came to autopsy in which the deaths were attributed to general peritonitis, leakage from wounds of the intestine and stomach which had been sutured at operation were found. It is interesting to note that in both these cases catgut sutures only were employed. In a very small per cent of the cases was catgut alone used, the majority of the operators using fine black silk. In no case was leakage noted from wounds sutured with silk.

The average time elapsed between injury and operation was between 3 and 4 hours, the shortest time one hour and the longest ten days. These patients on admission were given the usual treatment for shock, that is, heat was applied, salt solution and glucose were given intravenously, and so on. From my observation and experience it seems that we are inclined to operate too soon. We do not allow the patient sufficient time to recover from his initial shock before subjecting him to the further shock of an anesthetic and laparotomy. However, if there is active hemorrhage, delay will only add to the shock already present. In these cases the ideal treatment is to make your incision and then start giving a transfusion. In this way bleeding points may be ligated and the blood will not be lost in the peritoneal cavity. The time of operation in these cases is a point that will have to be left to the experience and judgment of the operating surgeon.

Twenty-one patients were operated upon who had no penetrating wounds, or if penetrating, no injury to the abdominal viscera was found. There was one death in this group due to intestinal obstruction. The operator finding a retro-peritoneal hematoma drained to it. A loop of intestine became adherent at the site of the drain, causing obstruction. At times it is very difficult to decide whether or not there has been injury to the abdominal viscera. The x-ray may be a useful aid in the diagnosis of such cases. As suggested by Mason, in shotgun injuries stereoscopic roentgenograms will give one a very definite idea as to whether or not the shot are in the peritoneal cavity and with flat plates air bubbles may be made out in perforations of the gastro-intestinal tract. However, should the x-ray findings be negative, and there are physical signs of visceral injury, I would certainly urge exploration as the mortality from operations in this group should be practically nil.

The question of drainage in gunshot wounds of the abdomen has been extensively argued pro and con. In this series between 80 and 90 per cent were drained. It seems to me that many cases are drained unnecessarily. When the operation is performed within a reasonable time after injury and there is no gross contamination I am convinced that it is better not to drain. It is impossible to drain the entire peritoneal cavity and in many cases the perforations are so widely scattered that I do not see how we can expect to accomplish anything by draining only a small portion.

CONCLUSIONS

(1) Combined abdominal and chest wounds stand a much smaller chance of recovery than either wounds of the chest or abdomen. The mortality in combined abdominal and chest wounds was 76.36 per cent, while the mortality of wounds of the abdomen only was 47 per cent.

(2) The two main causes of death in this series of cases were hemorrhage and peritonitis. By the more general use of transfusions we may

hope to reduce the mortality in the large hemorrhage group approximately 20 per cent.

(3) It is evident that many cases dying from peritonitis would have recovered had all visceral injuries been found and properly treated at the time of operation. By the use of transfusions given at the time of operation, the condition of these patients might be so improved that a more careful search for injuries could be carried out.

(4) It is not advisable to use catgut only in suturing wounds of the gastro-intestinal tract.

(5) Drain only those cases in which drainage is indicated and thus reduce the morbidity and probably the mortality.

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DISCUSSION (*Abstract*)

Dr. Carrington Williams, Richmond, Va.—To me, one of the most interesting phases of this subject is the history of the treatment of these patients. Otis in the "Medical History of the Civil War" refers to the fact that there were 32 American cases with extrusion and perforation of the small bowel operated upon between 1807 and 1869 with 27 recoveries. The most famous of these cases was Alexis St. Martin, with whom Beaumont carried out his well known experiments on digestion. Samuel D. Gross experimented on animals in 1843 and concluded that the abdomen should be opened to repair the damage of penetrating wounds. When we recall the high mortality of opening the abdomen in those days, it is not surprising that his advice was not followed. On the other hand, the text-books of the sixties advised repair of extruded intestine and this was generally practiced.

In 1869, Hunter McGuire wrote to Otis as follows: "Penetrating wounds of the belly are nearly all fatal, and we must look for some other means of saving life than we now have. If the shock, thermometer, etc., indicate wound of the bowel, cut down and sew it up. You say this is desperate. I answer the cases justify it. We must do something more than give opium and use ice poultices."

Again, in 1873, before the Medical Society of Virginia, he advocated exploration and referred to Longuest as being the first to suggest this. In 1881, as President of the American Medical Association, meeting in Richmond, he once more spoke for open operation on these cases. In this same year Marion Sims read his classical paper before the New York Academy of Medicine, proving that the abdomen should be opened, bleeding points ligated, injured viscera repaired, and drainage used according to the judgment of the operator. It is interesting that Sims used almost the same words as did Dr. Wilson in expressing an opinion against drainage in many cases.

The surgeons of those days thought the patient died from the toxic effect of "red serum." One of them said that the fibrinous peritonitis was of no importance. The mortality of these wounds in wars has been reported from 50 per cent in the Russo-Japanese to 92 per cent in the Crimean. In civil life they would have been lower, because as late as the Spanish-American War orders were issued against laparotomy except in well equipped base hospitals. In our army hospitals in France there were 3,546 abdominal wounds with 43.3 per cent mortality. The mortality from rifle ball was only 33.2 per cent, a remarkably good showing. The mortality is still too high.

Dr. Wilson's series is typical of the experience of other hospitals. I believe in prompt operation on these cases, but more of them die from hemorrhage than from peritonitis. The shock resulting from this hemorrhage should be treated and most of them can be improved before the abdomen is opened. Transfusion of blood is the greatest of all restoratives for hemorrhage. In Dr. Wilson's series only 26 of the 289 received transfusion. Without doubt many more of them needed it and would have had it except for the difficulty in securing donors. We have the same trouble here, especially with negro patients, because their friends are afraid to give their blood.

Finally, a word about anesthesia. Spinal is definitely contraindicated by shock; local is not enough for the wide exploration needed; ether is best for the relaxation and its margin of safety.

Dr. Frank P. Strickler, Louisville, Ky.—I am from Kentucky and I think you will all admit that no discussion of gunshot wounds would be complete unless it was discussed by some one from my State. Irvin Cobb has said of our elections that we can't count the ballots in Kentucky until all the inquests are over.

Nicholas Senn first called attention to the fact that the intestine, when first wounded forcibly contracts and that this contraction lasts for some time: that this prevents intestinal leakage. Therefore, the earlier it is possible to operate upon these cases, the better. As soon as you see your patient, have his blood typed and start him on venoclysis of 10 per cent glucose in normal saline or Ringer's solution. Take the patient to the operating room and while preparing for the operation, your assistants can give a citrate blood transfusion through the venoclysis apparatus by merely discontinuing the glucose and substituting the citrated blood. When the patient has received the blood, start the venoclysis again. The surgeon is losing no time and has already proceeded with the operation. I prefer to use black linen suture material in closing perfora-

tions. I still think that drainage should be used in these cases and if necessary an enterostomy should be done. Do not give these patients one blood transfusion: give them half a dozen if necessary. Get in all the relatives and friends and type them all for future use.

Keep your glucose solution going continuously. The average patient can take 3,500 c. c. in twenty-four hours easily. Let me sight a case which illustrates my point. A young man 22 years old had returned from a squirrel hunt. He used a 16-gauge full choke shotgun with number six shot. He put the stock of the gun on the floor and leaned on the muzzle of the gun and it went off, shooting away most of the muscle in the flank between the ilium and costal margin on the left side, also some of the costal cartilages and the tips of one or two ribs and left quite a few shot in the base of the left lung. I saw this young man about three hours later, after he had been driven a hundred miles in a Ford car. Some surgeons say that it is unnecessary to operate upon shotgun wounds of the abdomen, but this was not that kind of a case. This man was in a serious condition. We typed him at once; luckily, three friends came with him and they all matched. While this was being done in the laboratory, venoclysis was started and the man taken to the operating room. While I controlled the hemorrhage and cleared up the wrecked muscles and ribs and sewed up forty perforations with black linen, did an enterostomy and closed the abdomen with several Penrose drains in position, my assistants had given the patient 1,000 c. c. of citrated blood and continued the venoclysis. We gave this patient six blood transfusions in all and continued venoclysis two weeks, using both arms. After a rather stormy convalescence, this patient left the hospital in about six weeks, well. He will probably have a good sized hernia on the left side where his muscles were shot away.

Dr. M. H. Todd, Norfolk, Va.—I wish to emphasize one of the diagnostic points that Dr. Wilson mentioned, namely, the use of the x-ray to detect intestinal injury. Ordinarily x-ray examination is not called for, because the wounds are directly over the abdomen and the viscera are sure to be injured; but if the wounds are situated in the lower chest, or around in the flank, there may be some question about intra-abdominal injury.

In such cases of doubt, it is to be remembered that intestinal perforation is very apt to allow some gas to escape; and this gas can be seen with perfect clearness if an x-ray is made at the level of the top of the liver, with the patient held in the sitting position for a moment. It appears as a clear line separating the diaphragm from the liver. It can be seen early, and it will demonstrate a very small amount of escaped gas, positively indicating intestinal perforation.

If, however, no gas is shown, it does not guarantee that there is no intestinal injury; and in case of doubt, it is necessary to operate.

The second point that I wish to note is the grave difficulty in telling the difference between primary shock and hemorrhage. It is too bad that blood examination or other tests do not tell the two conditions apart. It is certainly necessary to wait for a while for shock to abate; but if there is continued bleeding, it must be stopped as soon as possible. Here, transfusion may be life-saving.

If operation shows bleeding as from a ruptured spleen, with no intestinal injury, it is possible to transfuse the patient with his own blood. This measure, autotransfusion, is also life-saving in ruptured ectopic pregnancy of course. It is said by some authorities that blood should not be used from a ruptured liver; I have no experience to offer on this point. In general, a ruptured spleen should be removed, and this is fortunately not usually difficult.

Sometimes in gunshot wounds quite a good deal of the substance of the abdominal wall is shot away, beneath the skin, and no peritoneum is left to cover the intestines over a considerable area. This seems to do no harm, though hernia is apt to follow the loss of muscle substance.

Combined chest and abdominal injuries may give rise to queer effects. For instance, I have seen a fecal empyema result. To my considerable surprise, the man did perfectly well.

I suppose that the question of drainage in abdominal wounds is still a matter of individual judgment; I have generally not drained, and have not regretted its omission.

After operation, I should think that nothing at all by mouth, with the continuous intravenous drip of Matas and Hendon, is probably the best procedure.

Dr. Wilson (closing).—I do not think it would be wise to treat all these cases without operation. Where the shot are more or less localized I would certainly advise exploration.

TRAUMATIC RUPTURE OF THE KIDNEY*

By JOHN G. PRATT, M.D.,†
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Traumatic rupture of the kidney occurs with a fair degree of frequency, but is not so common as is generally supposed. In a review of the records in Charity Hospital of New Orleans, a hospital of 1,800 beds, I have found twenty-one cases of traumatic rupture of the kidney which is slightly more than one case per year. It is hard for me to believe that these records represent the entire number of cases of traumatic rupture of the kidney admitted to the hospital, and I believe that some of the records have been lost in the files under diagnoses such as perinephritic abscess or renal extravasation of urine, *et cetera*.

In all the cases which I am reporting there was some type of trauma to the kidney region. Three patients were kicked by mules; one was kicked by a man; three were

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ruptured in automobile accidents; seven suffered from falls; one was run over by a wagon; two were hit by automobiles; one struck a piling while diving, and one was struck by a merry-go-round; two of the cases reported were injured on the football field. In all these cases there was a great variation in the extent of the rupture, ranging from a contusion of the kidney to rupture of the kidney into three parts. Pain in the kidney region was present in all the cases. Blood in the urine was consistently found, but the amount varied. The presence of a mass in the kidney region was not constant. In some cases there was none, whereas in others the mass was very large. The pulse rate on admission varied according to the degree of trauma and the size of the mass found in the kidney region. In those cases in which there was little or no mass present the pulse rate was either normal or very slightly elevated, whereas in those cases in which there was a moderate sized mass the pulse rate was increased proportionately to the size of the mass. In those cases in which the lumbar mass was large the pulse varied between 118 and 130. The elevation of temperature depended to some extent on the size of the hematoma, but mostly upon the presence of infection. Most of the cases on admission had a slight elevation of temperature ranging from 99 to 102°. In the majority of these a period of time had elapsed since the injury. In only two was the temperature normal and in two others the admission temperature was subnormal. The blood pressure was recorded in only five of the cases and in all five of these the blood pressure was normal. Operation was performed in 50 per cent of these cases, the time of operation varying from one to twenty-eight days after the patient was admitted to the hospital. In five cases, nephrectomy was done. In four cases a clot was evacuated or a perinephric abscess was drained. In one of the drainage cases the bleeding occurred from a ruptured psoas muscle. In another of the drained cases, bleeding from perirenal vessels was found at operation, but autopsy revealed that the upper pole of the kidney had been ruptured. In only two of the drainage cases was free pus found. In one, a suprapubic cystotomy was performed, but no reason was given for this procedure. Evidently there were some large clots in the bladder which prevented the patient from voiding. However, this case made a complete recovery after sixty days in the hospital. In eight cases cystoscopic examination was made. This was done only to determine from which side the bleeding occurred and the ureters were not catheterized. Of the five operative cases in which nephrectomies had been done four recovered and one died. Of the drained cases, three recovered and one died. In the one fatal case, rupture of the kidney was missed at operation and not discovered until at autopsy. In five cases seen in private practice, three were not operated upon, whereas two were. One was operated upon four days after injury and the other ten days after injury. All private cases, operative and non-operative, recovered. In the two operative cases operation was done because of the large size of the mass and the pain which accompanied it. In one of these cases the kidney was found to have two distinct ruptures so that nephrectomy was performed. In the other case the kidney was in a large hematoma. After removing the hematoma, the renal artery was found to be torn. A clamp was placed on the artery and the kidney removed.

Ruptured kidneys usually occur in people who are leading an active life and very rarely in elderly people, except as the result of accidental injury as being struck by an auto or some similar force. Sometimes the blow causing the kidney to rupture seems rather insignificant and may leave no external evidence that the patient has been struck. This leads me to believe that the rupture of the kidney is due to a momentary fixation of the kidney through the fixation of the diaphragm caused by a sudden inhalation. This pushes the kidney down below the costal margin, fixing the kidney at its lowest point of excursion. Accompanying this there is an increase of abdominal pressure and a spasmodic contraction of the muscles of the back. The blow is transmitted through these muscles directly to the kidney. The degree of rupture varies considerably from a slight internal laceration of the kidney accompanied by hematuria, but no extrarenal mass to complete rupture of the organ and at times actual tearing of the kidney from its pedicle. In some cases the capsule of the kidney may remain intact, the hematoma collecting beneath it. In others these capsules may be ruptured, the bleeding occurring in the perinephric capsule. In both groups of cases there is more or less splinting of the kidney by the hematoma and bleeding will cease after the tension has reached a certain point. There is another type of rupture in which the tear extends into the pelvis of the kidney, in which case there will be some escape of urine along with the blood into the

perinephric capsule. Most of these subsequently break down with abscess formation. When a hemorrhage occurs beneath the true capsule of the kidney without rupturing it, pain may be the predominating symptom. This may be so severe as to require operative relief.

If one remembers the anatomy of the perirenal fascia, which is derived from the primitive parietal peritoneum, one recalls that it is made up of a fibrous sheet accompanying the posterior peritoneum which, in reaching the kidney, is divided into an anterior leaf (perirenal fascia) and a posterior leaf (retrorenal fascia) completely surrounding the kidney (Glantenney and Gosset). These two leaves surround the suprarenal gland, above which they converge and are fixed to the diaphragm. It is evident that in this position in which the kidney is placed within a more or less fibrous perirenal capsule and embedded in a large amount of fat, hemorrhage, although it may be fairly massive, will often be controlled by the pressure in the perinephric capsule. In those cases in which the hemorrhage is not controlled by the pressure within the perinephric capsule one finds a rupture of this perirenal fascia with hemorrhage extending either into the peritoneal cavity or infiltrating downward along the posterior wall of the abdomen. Hemorrhage as extensive as this will usually be accompanied by a considerable amount of shock, whereas in cases in which the hemorrhage is limited within the perirenal fatty capsule, shock is not marked, although the lumbar mass may be quite large. Where there is a great deal of shock operation is imperative, every effort first being made to control shock by immediate supportive treatment, such as transfusions and infusions. To save the patient's life it is imperative that the bleeding be controlled as soon as possible. In those cases in which the hematoma is more or less encapsulated by the perirenal fascia one may wait and choose his time for operation.

I did this in one of my cases and on the sixth day the patient had a marked rise in temperature and an increase in leukocyte count. I felt that the hematoma had become infected, but waited four or five days longer before incising his loin and draining the perinephric abscess. Two or three days later the discharge had a uriniferous odor and the suspicion of a urinary fistula was verified by the administration of indigo-carmine. The urinary fistula persisted for about ten days, following which the wound began to heal. The healing was rather rapid, but before the urine had ceased to come from the wound I did a retrograde pyelogram and found the pyelographic fluid in the wound. Six weeks later a nearly normal pyelogram was obtained. The kidney shadow was very much like that of the figure eight, with a marked indentation in the cortex, leading me to believe that the kidney had been ruptured through its middle portion. This kidney subsequently showed only a slight reduction in function as compared with the normal kidney. There was still some persistent infection in the kidney. Lavage was instituted, following which the urine became sterile.

I believe that in this case a large amount of good kidney tissue was preserved by conservative measures, and that had I operated as soon as the patient came in I should have had to remove the kidney and should have unnecessarily sacrificed good kidney tissue. It was this case which led me to believe that quite often surgeons are too radical in treating traumatic ruptures of the kidney, and that with conservative treatment a great many of these kidneys, although damaged partially, may be saved.

Many cases of ruptured kidney go to the general surgeon and a fair number of these cases are treated by him without a consultation with the urologist. This, in my opinion, is a very dangerous procedure, especially if the treatment be surgical. It is imperative that the surgeon know preoperatively whether another kidney is present or not, and, if present, its function.

The first question that confronts the operator is, should the kidney be exposed? This can be answered only by the condition of the patient: that is, the degree of trauma, the extent of hemorrhage, size of the mass, shock, and so on. After the kidney is exposed the next question is whether the kidney can be conserved by suturing or whether a nephrectomy should be done. This question can be answered only by the findings at exposure and by the judgment of the surgeon. At times rupture of a kidney may be complicated by rupture of other viscera, in which case the degree of shock is very much greater and prognosis much graver. Two such cases appear in the records of Charity Hospital. I am sure that death, which occurred within one hour of admission, was not due to the kidney trauma, but in one case to a fractured skull and in the other to abdominal hemorrhage from the spleen.

SUMMARY

(1) The degree of rupture of the kidney varies to such a great extent that I believe only those cases in which there is a hematoma mass or extrarenal bleeding in the kidney area should be classed as rupture; the others should be considered contusions.

(2) In a large majority of the cases of rupture there is ample time for close study of the

case and the use of one's judgment as to what procedure to follow.

(3) All cases in which shock is the predominating symptom should be given ample supportive treatment before operation.

(4) Conservation of the kidney should be carried out, if possible, without endangering the patient's life.

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INTRAVENOUS USE OF METHYLENE BLUE IN THE TREATMENT OF CYANIDE AND CARBON MONOXIDE POISONING*

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A definite lag exists between present day knowledge and present day application of that knowledge. While this statement is pertinent to the field of preventive medicine, it holds true also in the fields of general medicine.

It had been known for several years that solutions of methylene blue, on intravenous injection, modified the effects of cyanide to such an extent that animals were able to recover from otherwise usually lethal doses of this highly poisonous compound. Indeed, Thunberg, in 1917, called attention to the possibilities of practical application in the use of the dye for the treatment of cyanide poisoning in man.

The futility of the use of the older methods of treatment of cyanide poisoning in three rapidly fatal cases in San Francisco in July of 1932 aroused our interest in the treatment of all types of poisoning as carried out in the Department of Public Health Emergency Hospital Service. At the invitation of the Director of Public Health, a survey was made by the professors of pharmacology of the two medical schools in San Francisco, with the result that a protocol, prepared by Dr. Hanzlik, of Leland Stanford Junior University Medical School, outlining modern accepted methods of treatment in the various types of poisoning, was submitted for the use of the Service. Among the many suggestions made by Professor Hanzlik was that involving the use of methylene blue in cyanide poisoning.

Several weeks later, Mrs. M. M. Brooks directed attention to the possibilities that experimental data were available which might be interpreted as supporting and justifying the use of the dye in carbon monoxide poisoning also.

These introductory explanatory statements outline the circumstances leading up to the initiation of the use of solutions of methylene blue in the Emergency Hospital Service within the Department of Public Health in San Francisco. We wish to emphasize that the suggestion that the dye offered possibilities of practical application in the treatment of cyanide poisoning in man was not new; but we wish to point out also that, to our knowledge at least, the dye had not been used in the treatment of cyanide poisoning in man prior to the inauguration of its use in San Francisco. The use of methylene blue was authorized by executive order of the Director of Public Health, on the suggestion of scientific investigators who had experimental evidence which seemed to justify the intravenous injection of the dye in the human subject, first in cyanide poisoning, and, later, in carbon monoxide poisoning.

It is the purpose of this paper to present a very brief summary of the results of the use of the dye in the treatment of both cyanide and carbon monoxide poisoning in San Francisco. Since we ourselves have conducted no experimental animal laboratory studies, although these might well be carried out in investigating the biochemical and pharmacological aspects of the problem, we cannot adequately discuss these phases of the subject. In most instances, observations and laboratory data are necessarily incomplete because of inadequate facilities for unhurried study and follow-up. We believe, however, that this presentation is justified be-

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cause of the general interest in the treatment itself, because of the promising results obtained in the San Francisco series of cases of poisoning in the human, and because of the need for reawakened interest in the treatment of various types of poisoning by modern methods based on rational pharmacologic methods.

THE METHYLENE BLUE TREATMENT

The method of treatment with methylene blue is as follows: the dye used is the product marketed as "Methylene Blue, U.S.P. (medicinal)," and it is administered intravenously, with the usual precautions, in 50 c. c. doses, in a 1 per cent solution, either aqueous or in a physiologically normal (isotonic, or about 1.8 per cent) solution of sodium sulphate. It was first suggested that the solution be made up with physiologically normal solution of sodium chloride, but this was found to present certain difficulties, for, with sterilization at fifteen pounds pressure for fifteen minutes, there were found a precipitate, an appreciable color change, and a determinable variation in pH. It was believed advisable to use the aqueous solution, therefore, even though this preparation was hypotonic and its injection carried with it the disadvantages of hemolysis, et cetera, at least until laboratory studies could be carried out to suggest improved solutions. On the basis of physicochemical studies, with the confirmation of the pharmacologists, it is now suggested that the physiologically normal (isotonic, or about 1.8 per cent) solution of sodium sulphate be used. This obviates the difficulties probably due to the common chloride ion in the sodium chloride solution, and also obviates the disadvantages of the hypotonic aqueous solution. Both the aqueous and the sodium sulphate solutions of methylene blue are stable and will keep, in sealed ampoules, for long periods of time. It has been suggested that glucose solutions might be useful as the base for the final preparation, but it is believed that there should be available at all times a stable solution for immediate use, and, since glucose solutions are not stable over long periods, fresh solutions would have to be made up frequently at considerable expense and waste, or cause a delay at the time of the emergency.

Methylene blue injected intravenously does possess some degree of toxicity, but not in man in amounts less than 150 c. c. of a 1 per cent solution administered within a period of two hours. Such toxicity occurs independently of such solvents as water or isotonic sodium sulphate solution. Apparently, in animal experimentation, the rabbit is more sensitive than other animals to the dye.

The dye and the sodium sulphate should be of U.S.P. degree of purity and the solutions should be filtered before sterilization.

We wish to point out and to emphasize again that the use of solutions of methylene blue in the treatment of cyanide and carbon monoxide poisoning, particularly, is as an adjunct and not the sole measure to be instituted. Gastric lavage, when the poison has been taken by mouth, artificial respiration, inhalations of oxygen and carbon dioxide, cardiorespiratory stimulants, supportive and eliminative therapy as indicated, are certainly not to be neglected or omitted. We believe methylene blue to be useful, and we sincerely believe the results in our small series justify the continuation of its use. We are not unmindful, however, of the genuine need of more careful observation and of more detailed laboratory study in each instance before any positive statement can be made to the effect that methylene blue will or will not accomplish certain ends.

It is quite clearly demonstrated, we believe, that the clinical results in the treatment of cyanide poisoning with methylene blue confirm those of experimental pharmacology.

CYANIDE POISONING

Six cases of cyanide poisoning have been treated in the Emergency Hospital Service during the first year following the introduction of the use of the intravenously injected solutions of methylene blue. Two of these have been described in some detail;[1,2] a third was briefly summarized in a third note;[3] the other three can be but referred to in this article.

C. R. A., a white male of about sixty years, who presumably attempted suicide, was admitted in coma. No information other than the physical findings was available and, although the clinical picture was more nearly that of coma in acute myocardial failure, methylene blue was given, since cyanide poisoning was kept in mind by the surgeon on duty. Death occurred within a short period, and the diagnosis of cyanide poisoning was made by laboratory study of the contents of the stomach and upper small intestine. (This is the one fatal termination in the six cases of the series.)

E. M., a white male of about 55 years, attempted suicide by taking potassium cyanide, but was able to give this information before losing consciousness. The beginning of treatment, on arrival at the hospital, was after the usual signs of cyanide poisoning had set in. A total quantity of 100 c. c. of the solution of the dye was injected within 45 minutes. Recovery was complete and without complications.

H. M., a white male of about sixty years, a druggist by occupation, attempted suicide by swallowing a quantity of a dilute solution of hydrocyanic acid. By the time he was brought to the hospital, unconsciousness, cyanosis, stertorous and irregular respiration and other definite physical signs of poisoning had appeared. A mixture of 95 per cent oxygen and 5 per cent carbon dioxide ("carbogen"), was administered at the same time the dye was given intravenously. Recovery was complete and rapid without remarkable incident.

The effects of the dye in cyanide poisoning are seen within a few minutes following the beginning of the intravenous injection, and are so definite that they may be described as truly dramatic.

CARBON MONOXIDE POISONING

Methylene blue solutions have been used in treating what was probably carbon monoxide poisoning in nine instances. In two cases, all signs of circulatory and respiratory activity had ceased before arrival at the hospital; the above mentioned oxygen-carbon dioxide mixture, artificial respiration, and methylene blue were given in an attempt to restore function, without apparent physiological response. Five cases have been described,[1 2 3] and very brief reference only to the remaining two is made here:

F. C., a white male of middle age, was found sitting unconscious in his closed automobile in a closed garage, with the exhaust gases conducted into the closed body by means of a flexible hose, the motor still running. Artificial respiration and carbogen were administered by the steward *en route* to the hospital, where methylene blue was given. A return to the unconscious state, following a favorable reaction after the first injection of methylene blue, was believed to be sufficient to justify a second injection, and the reaction following this second 50 c. c. was lasting. He was discharged about 12 hours later and no deleterious effects were apparent. Unfortunately, no laboratory studies were made.

M. W., a white male of 53 years, who attempted suicide in the same manner as F. C. (the preceding case), was brought to the hospital under similar circumstances (unconscious in spite of oxygen-carbon dioxide and artificial respiration given *en route* to the hospital). A second injection of the solution was administered within 15 minutes in this case and consciousness returned shortly thereafter. Although the patient could have left the hospital within twelve hours, as in the case of F. C., he was held for thirty-six hours to permit the taking of blood specimens for study in the laboratory.

Blood specimens were taken at approximately 12-hour intervals, and studied by Professor C. D. Leake, of the Department of Pharmacology of the University of California, for evidence of methemoglobin (oxyhemoglobin spectroscopically) and hemolysis. Although methemoglobin was not present in quantities sufficient to produce changes detectable by spectroscopic methods, there was a definite reduction of oxyhemoglobin (which might be interpreted as evidence of a formation of methemoglobin) and appreciable hemolysis in the specimen obtained 12 hours after treatment. There was a return to near-normal conditions in the 24-hour specimen and entirely normal findings presented themselves in the 36-hour specimen. If methemoglobin were present, the concentration per cent must have been less than 15, the minimum detectable by the spectroscope.

DISCUSSION

The literature, over a period of more than twenty years, contains the writings of many investigators who have conducted researches into the various biochemical and pharmacological aspects of the effects of methylene blue. The subject has attracted many, and much time has been devoted to these problems. It is believed that this is not the proper place or time for a review of the literature. As we have stated previously, we have carried out no animal laboratory investigations, and any statement that we might make on that phase of the subject would necessarily be of others' work.

From our observations, and from the more detailed clinical observations of the surgeons of the Emergency Hospital Service, it appears that methylene blue solutions, used intravenously, are of definite benefit in the treatment of cyanide poisoning. Its effects are rapid and truly dramatic. In the treatment of carbon monoxide poisoning, while the effects are less rapid, certainly less dramatic, and apparently fleeting in character as compared with the permanent effects in cyanide poisoning, we believe that methylene blue may be used successfully. We admit that the experimental evidence offered by the Yale group of investigators[4] appears to confirm the hypothesis that the dye acts as a synergist, but the clinical use of the dye solutions in our series was at least not fatally injurious, and may have had a supportive action to the other treatment given concurrently. It is possible, indeed probable, that methemoglobin is found after the injection of methylene blue, but the change is not immediate, apparently, and, while one case is admittedly insufficient as a basis for any definite statement, it would appear in the one case cited that methemoglobin is formed in but small quantities during the first 24 hours, and that there is a rapid return to the balanced, normal physiologic and chemical state.

No investigator has yet offered a satisfactory or complete answer to the question, "How does methylene blue act in the treatment of cyanide poisoning?" The question cannot rationally include carbon monoxide poisoning because the

circumstances in the two affections are entirely different and the mechanism, while it involves the oxidation-reduction reaction in both, is different in the two states of poisoning. The explanation probably includes complex biochemical reactions involving ferments or enzymes and cannot be easily expressed in chemical formulae. Obviously, there must be some mechanism whereby either the effects of cyanide are counteracted or neutralized, thereby permitting the normal respiratory and oxidative functions to be resumed sufficiently to allow life to continue, or methylene blue itself must assume some catalytic property or power of carrying oxygen. The latter is improbable and the former involves many possibilities, such as its action as a respiratory catalyst in the cells, a mechanism considered by some investigators. It is also possible that methylene blue may enable intracellular oxidation to proceed in the absence of enough available oxygen in the blood, in carbon monoxide poisoning, or when the normal iron oxidation mechanism is interfered with, in cyanide poisoning. We are prepared to state only that the use of the dye has been demonstrated to be beneficial in the treatment of cyanide poisoning, and we believe it shows promise, possibly as a supportive measure, in the treatment of carbon monoxide poisoning also.

SUMMARY

(1) The use of methylene blue solutions intravenously in the treatment of cyanide and carbon monoxide poisoning in man was initiated during the summer of 1932 in the San Francisco Department of Public Health Emergency Hospital Service, on executive order of the Director of Public Health, at the suggestion of scientific investigators, who presented experimental evidence and data to support this procedure. To our knowledge, although the suggestion had been made many years before, this was the first time that the treatment had been actually carried out in the human subject.

(2) In a small series of six cases of cyanide poisoning, the use of the dye has been successful, even dramatic, in its effects in five instances, with no complications or sequelae worthy of note, in confirmation of pharmacologic data establishing its efficacy.

(3) In nine cases of carbon monoxide poisoning, the use of the dye as an adjunct to carbon dioxide and oxygen has been without apparent untoward or deleterious effects. In two cases it is believed that the patients were dead on arrival at the hospital, but in all others recovery was complete.

(4) Laboratory data are incomplete, but clinical observations in cases of poisoning in the human support the premise that the treatment is beneficial, and refute the statement that "the use of the dye is contributory to death."

CONCLUSION

On the basis of clinical observation, it is believed that the use of solutions of methylene blue is definitely established as beneficial in the treatment of cyanide poisoning, and that this same form of therapy may be used as a supportive measure in the treatment of carbon monoxide poisoning.

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Southern Medical Journal

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EDITORIAL DEPARTMENT

SOUTHERN MEDICAL ASSOCIATION
Twenty-Eighth Annual Meeting
San Antonio, Texas, November 13-16, 1934

THE SAN ANTONIO MEETING

Because San Antonio is off-center in the Southern territory, some difficulty might have been anticipated in planning a program to be held there which would be representative of the medical profession of the whole country. However, arrangements have been made with encouraging ease, and physicians from Boston, New York, Philadelphia, Chicago, Rochester, San Francisco, from France and England, as well as equally distinguished men from points nearer, will address the Association at its twenty-eighth meeting. There will be in addition several Mexican physicians on the program. Americans are fortunate in having an unusual opportunity of learning how medicine is practiced in this little known, immediately adjacent country.

On Tuesday, the first day of the meeting, there will be a general medical clinical session and a general surgical clinical session. On the same day will be held meetings of the Texas Pediatric Society, Texas Dermatological Society, Texas Ophthalmological and Otolaryngological Society, and the Southern Branch of the American Public Health Association.

Tuesday night will be Presidents' Night. Dr. Hugh Leslie Moore, of Dallas, will deliver his presidential address. Presidents of a number of other important medical organizations, both American and foreign, will be with Dr. Moore on the platform and will also speak briefly.

A general clinical session conducted by specialists from different parts of the country will be held Wednesday. Several sections will meet concurrently. Thursday and Friday will be occupied with the various sections and the associations meeting conjointly with the Southern Medical Association.

State medicine has become a subject in which every practitioner of medicine has some interest. There will be a round table luncheon for a discussion of state medicine, probably on Wednesday. The luncheon will be presided over by Dr. Edward H. Cary, of Dallas, past president of the Southern Medical Association and of the American Medical Association. Dr. Cary has studied this question for a number of years. He has brought to bear upon it the clear vision and ability with which he has attacked other scientific and organizational problems. The subject will be discussed by men with diverging views. All are invited to attend.

On Thursday there will be two round table luncheons, one on general medicine and one on general surgery. Questions will be answered by outstanding visiting physicians and surgeons.

On Tuesday evening following the general meeting will be held the President's reception and grand ball, and on Thursday night a unique entertainment will be a "Night in Old Mexico," with Mexican music.

Alumni reunions and special dinners will be held on Wednesday evening.

The Gunter Hotel is general hotel headquarters. The registration, scientific and technical exhibits will all be on its mezzanine floor, and many of the sections will meet in the hotel. The Plaza Hotel is headquarters for the American Society of Tropical Medicine, the National Malaria Committee, and the Southern Branch, American Public Health Association; and the St. Anthony Hotel is headquarters for the Southern Association of Anesthetists and the Woman's Auxiliary. The Clinical Sessions, some section meetings, some conjoint meetings and the luncheons will be held at the Plaza and St. Anthony Hotels. All scientific activities will be situated within one to three blocks of each other, all in down town San Antonio.

Following the San Antonio meeting, the As-

sociation will sponsor an official trip to Mexico, with Mexico City as the focal point. Arrangements are being made for a special train for the Mexican trip. It is planned to stop long enough in Monterrey to see the industrial city of Mexico. From Mexico City other places of interest and importance will be visited. In Mexico City, physicians will be interested in seeing the Hospital de Jesus, built by the conqueror, Cortez, in 1527, which has been in continuous operation as a hospital, as a place for the care of the sick, for 407 years. It is the oldest hospital on the Western Hemisphere.

Reduced railroad rates have been granted by all railroads, the rate being one and one-third fare for the round trip to San Antonio, going and returning the same way, or going one way and returning another, with a final limit of thirty days. To secure the reduced rates certificates should be obtained from the Southern Medical Association office about three weeks in advance of the meeting.

San Antonio has a large and active medical profession and medical facilities in keeping with the size and importance of the City. Connected with the army posts also are medical men of outstanding reputation. Physicians interested particularly in aviation will enjoy a visit to Randolph Field, the "West Point of the Air." The medical society of San Antonio, the Bexar County Medical Society, has its own home, very completely equipped for its purposes.

Plans for the meeting November 13-16 are in a very promising stage, and hotel reservations should be made early.

PREVENTION OF WHOOPING COUGH

In 1931, all pertussis vaccines were officially omitted from "New and Nonofficial Remedies" because "in the twenty years that had then elapsed since the first use of such a vaccine, no conclusive evidence had been accumulated regarding the therapeutic or prophylactic efficacy of such preparations."[1] Another vaccine has this year attempted to reopen the question of prevention of whooping cough. Its development and differences from the rejected preparations are worthy of examination.

Madsen,[2] of Copenhagen, in 1929, reported a whooping cough vaccine prepared in the State Serum Institute and tried over several years in a segregated community of the Faroe Islands. Strains of *B. pertussis* which had been recently isolated from human cases were cultivated upon blood agar, and suspended in normal saline to which 1 per cent formaldehyde was added. The older preparations of the Bordet-Gengou bacillus were heat-killed.[3] Madsen's vaccine apparently depended entirely upon the formaldehyde for inactivation of the culture. The suspensions were injected into children in three doses. A total of about 22 billion micro-organisms per patient was administered. Madsen reported that whooping cough occurred freely in the vaccinated children on the Islands; but the death rate was much lower in the vaccinated than in the unvaccinated.

Sauer,[4] of Evanston, Illinois, used a modification of the Danish method, first in the treatment of whooping cough and later in attempts at immunization. Freshly isolated strains of *B. pertussis* were cultivated on the original Bordet human blood media, suspended in saline with a small amount of phenol, kept in the refrigerator for a week, and given the usual tests for sterility. Again the bacteria were not heat-killed. A total of about eighty billion bacteria, four times Madsen's dose, which was already large, were employed for immunization of each patient. No amelioration of symptoms was noted in children who had been exposed to the disease or in those who were exposed soon after injection. After five years' observation on the effects in families in which some of the children were vaccinated but a susceptible child was left unvaccinated as control, Sauer reports 100 per cent prevention of whooping cough in all who were injected three months or more before exposure. The vaccine was totally ineffective in arresting an epidemic after children had been exposed, but prevented the disease in all patients inoculated three months or longer before contact with the disease.

Thus a vaccine killed by standing with phenol instead of by heating, and injected in very large dosage, is claimed to accomplish what other preparations of the same bacillus after twenty years' trial have failed to do, a valuable observation if correct.

1. Report of Council on Pharmacy and Chemistry of A.M.A. Pertussis Vaccine. J.A.M.A., **102**:692, March, 1934.

2. Madsen, Thorvald: Vaccination Against Whooping Cough. J.A.M.A., **101**:187, 1933.

3. New and Nonofficial Remedies, p. 371. Chicago: American Medical Association, 1929.

4. Sauer, Louis W.: Immunization with B. pertussis Vaccine. J.A.M.A., **101**:1449, Nov. 4, 1933.

Another new preparation has also been actively supported, an endotoxin, obtained by breaking up the cells of *B. pertussis*.[1]

It is one of the commonest errors of therapeutic logic to say, not, "Is this technic or drug in itself particularly promising?" but, "This disease is so dangerous that any straw of hope is worth grasping." The fact that whooping cough is dangerous has nothing whatever to do with the value or worthlessness of a preventive.

The question of reactions is to be taken into account in administration of Sauer's vaccine. Madsen, who used only one-fourth the dose recommended by Sauer, notes the death of two newborn infants shortly after injections. His colleagues have observed considerable malaise in older children.

The report of the Council on Pharmacy and Chemistry of the American Medical Association on the preparation is a postponement. The Council notes that the series of cases described occurred in a single locality, and that Sauer's observations are directly contradictory of numerous past results. The vaccine has attained some vogue. According to Sauer, seventy physicians secured it for trial between February and May of 1933. Favorable reports have been made. Enough injections have doubtless now been given to throw considerable light upon the subject. The medical profession can afford to await further accounts of the effects.

GLEANINGS FROM RECENT JOURNALS

Bacillus Acidophilus and Decay of the Teeth.—A few years ago, beginning with the observation of Metchnikoff that the Bulgarians were a long-lived race, and that sour milk formed a large part of their diet, *Bacillus bulgaricus* and *Bacillus acidophilus* became popular therapeutic agents. *B. acidophilus* was perhaps more popular.[2] It was given to patients with various intestinal disorders, including certain types of diarrhea and constipation. Cultures were ingested, and since a carbohydrate diet favored their growth, lactose and dextrose were administered with them. Results were reported as encouraging.

From the University of Michigan School of Dentistry, a number of contributions have come upon the subject of diet in relation to dental caries. A recent communication[3] deals with the relation of diet, *Bacillus acidophilus* in the saliva, and tooth decay. Biochemical analyses of food, excreta, and blood chemical studies were included of a group of children on several types of diet. The basal diet was adequate in the known necessary food factors; it contained no desserts except fresh raw fruit. On this diet dental caries was very low. Other diets studied contained varying amounts of added sugar, given as candy, in addition to the maintenance ration.

When little sugar was eaten, the number of acidophilus bacilli in the saliva was quite low. As sugar intake increased, *B. acidophilus* in the saliva rose, and dental decay also rose proportionately in the majority of cases. Some children, say the Michigan workers, are naturally immune to dental decay, and do not show caries even on a high sugar diet. Others are extremely susceptible and will continue to develop cavities even if they eat no sugar. In the majority, however, with increased ingestion of sugar *B. acidophilus* rose and caries increased; and with elimination of the candy, *B. acidophilus* was unable to develop and caries was arrested.

This micro-organism, formerly regarded as an aid to health and encouraged by physicians, would now seem closely associated with tooth decay and rather to be avoided.

Effect of Phenobarbital and Amidopyrine on Myeloid Leukemia.—There is a prevailing belief that the coal tar products in common medicinal use may reduce the white blood cells of normal persons, with the usual symptoms of granulopenia. Benzol poisoning some years ago was observed to have this effect. Terry and Sanders,[4] of Palo Alto, California, report the treatment of a case of myelogenous leukemia in a negro man with phenobarbital and amidopyrine. After other measures had failed, they administered these drugs in large doses. They report a fall of the leukocytes, chiefly the myeloblasts, from 297,000 to 25,550, and clinical improvement. Benzol has at times been employed in this disease, with results usually noted as discouraging.

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Parathyroid Disease: Is it a Common Clinical Entity?—Various papers of recent years have dealt with disease of the parathyroid glands, particularly since the demonstration by a group of investigators in Massachusetts and New York, of a syndrome of parathyroid adenoma, relieved by operative removal of the tumor.[1] Hyperparathyroidism has been accepted as the cause of osteitis fibrosa cystica.[2] It has been suggested that it may be a cause of some forms of arthritis.[3] Albright, Aub and Bauer,[2] who have extensively studied the mineral metabolism of cases of proven parathyroid tumor, report the removal of seventeen of these growths. They describe the syndrome, with its diagnostic signs, and express the belief that it occurs frequently, and is often associated with urinary calculi. The phosphorus of the blood, according to these authors, is low in hyperparathyroidism and the blood calcium is high. The urinary excretion of both elements is high. The blood findings, high calcium and low phosphorus, they say, occur in no other disease except hyperactivity of the parathyroid glands.

For further study of the condition, and of the effects of operative treatment, it is of great value to have these decisive diagnostic blood chemical tests.

TWENTY-FIVE YEARS AGO

FROM JOURNALS OF 1909

Is Divorce an Evil?[4]—"The increasing number of divorces is a biological phenomenon which needs scientific explanation to determine whether it is the unmitigated evil it is usually assumed to be."

The Economic Trend.[5]—". . . The condition of the average general practitioner is far from encouraging. . . . In many of our large cities in the past two years there has been a decline in general office and family practice of over 50 per cent. . . . Various are the causes blamed . . . sanitation and prophylaxis . . . the trend of the profession towards organization . . . has made medicine a sordid business . . . the enormous extension of surgery has truly frightened the people . . . the monstrous evil of the abuse of medical charity has almost pauperized the medical profession. . . . The burden of the sick poor should be assumed entirely by the community. . . . Few . . . will deny that specialism in medicine has been carried too far."

Is the Entire Profession Honorable?[6]—"The North Pole has been for years the goal of the most intrepid and courageous explorers in every civilized nation. Apparently at last it has been attained . . . by a Brooklyn physician, Dr. Frederick A. Cook. . . . An unfortunate controversy was precipitated at once by the savage attack of Lieutenant Peary on the veracity of Dr. Cook. . . . The American medical profession believes in Dr. Cook. . . ."

Dr. Mayo on the Parathyroids.[7]—"These glands as compared with other organs and lesions are singularly free from serious disease, especially those of a surgical nature. . . . Should tetany follow an operation for the removal of the goiters . . . if the above remedies [calcium, etc.] can but maintain life until parathyroid glands can be secured, transplanted and function obtained, it may be possible to tide the patient over. . . . Halsted . . . obtains the best results by implanting the glands beneath the posterior sheath of the rectus abdominis."

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San Antonio, Where We Meet

ORGANIZED MEDICINE IN SAN ANTONIO*

Every Southern city has its hospitals to which it can point with pride. San Antonio has its hospitals that are a credit, but San Antonio has also an institution which is more or less unique. This is the Bexar County Medical Library Association and its affiliated organizations.

The background of this organization and the beginning of organized medicine in Southwest Texas date back to 1853. In that year the Texas State Medical Association issued a charter to the Bexar County Medical Society. The original of this charter still hangs in the Library of the Society. The medical pioneers of that early day carried on with dignity

*By Dr. Pat Ireland Nixon, San Antonio, Chairman of Publicity for the Southern Medical Association's San Antonio meeting.

and courage until the Civil War and Reconstruction Period retarded the progress of medicine. Then there came the Golden Age of medicine and surgery, based on the work of Pasteur and Lister, and a needed stimulus was supplied to organized medicine in Texas. The new century found scientific medicine in Bexar County well to the front, but organized medicine had grown stale and sluggish.

Those were the Dark Ages of the medical profession of Bexar County, because the Medical Society was cast about from place to place like a wandering waif. They met in the old Court House on Soledad Street, then at the Elks Club on Commerce Street, at the San Antonio Loan and Trust Company Building, at the University Club on Commerce Street, at the Chamber of Commerce Building on Losoya Street and finally, as their feeling of respectability and responsibility increased, in a small room on the first floor of the St. Anthony Hotel.

In 1912 a few of the younger men of San Antonio conceived the idea of forming a small nucleus for a

Home of the Bexar County Medical Society.

library. Each contributed $10.00 a year and they subscribed to several current medical and surgical periodicals. The Moore Building was generous enough to allow the group to use a small rear room on the fourth floor. This rather dingy setting did not affect the ardor of those who began the library movement, and it was not long until others were added to the list. This room was used until 1915.

About this time the Bexar County Medical Society found it necessary again to seek new quarters.

The manager of the Bedell Building came to the Society's rescue and new quarters were obtained in this building. A large room was donated and on June 7, 1915, the Society moved in. Comfortable chairs to seat seventy-two persons were installed and other necessary equipment was purchased. The books and journals that had accumulated in the Moore Building were moved over at the same time. The journal subscriptions were gradually increased, so that it was not long before they were making a respectable showing. The library soon was recognized as a necessity for San Antonio.

In 1919, after four years, the Society was notified that it would have to vacate, and again it became homeless.

The idea of a permanent home was being agitated. A committee was appointed by the president and a plan worked out whereby as many members as possible were urged to contribute $100.00 in the form of stock in the Bexar County Medical Library Association. This in reality was the initial movement that eventuated in the Library Association as we know it today. A thorough canvass of the members of the Medical Society was made and less than fifty were found who could be induced to believe that this idea was not visionary. It should be recalled that the membership at that time was only one hundred seventy-seven, so this was not a poor showing. However, many more subscriptions were necessary.

A place adaptable for the purpose and compatible with the possible size of the pocket book of the Association was found on Lexington Avenue at a price of $20,000, of which it was necessary to pay $10,000 cash. cash.

This seemed like an insurmountable task, but after the presentation of a medical farce which will long be remembered in San Antonio, sufficient subscriptions were secured. A successful hoax marked the beginning of the Bexar County Medical Library Association on November 26, 1919.

The thirteen years on Lexington Avenue saw the membership of the Society grow from one hundred seventy-seven to two hundred fifty and the average attendance at the Society's meetings, which had been thirty in the Bedell Building, increased to seventy-five. More important was the growth in understanding and mutual esteem.

The depression which came late in 1929 affected the medical profession and the Medical Library very seriously. As a result, there was a slight loss in the Society membership and it became necessary to reduce the dues $10.00 per year. From 1929 to 1933, conditions from a medical standpoint became increasingly difficult and no one dreamed that any change in location was possible. However, the attention of the Board of Directors of the Library Association was called to the Bedell Moore property on West French Place and the possibility that we might effect a satisfactory exchange of our property for this. Through the efforts of a committee sixty-three new subscriptions to the Library Association were secured. As a result of this enthusiastic campaign, the Library Association voted to effect the exchange for the Bedell Moore property at a meeting on April 7, 1933.

This property is situated in a highly restricted residential section of San Antonio on a hill, with a commanding view of the City to the south. The grounds, fronting 260 feet on West French Place, and extending 300 feet deep to Ashby Place, are beautifully terraced and shaded by a great variety of native and exotic trees. There are two large greenhouses which are the particular delight of the Woman's Auxiliary. A deep

well solves much of the problem of the upkeep of the lawn, shrubs and flowers. The property is conservatively worth $100,000.

The first floor of the building is occupied by reading rooms and the library of 6,000 volumes. On this floor are also found a large, well equipped kitchen and dining room, which play no small part in increasing the attendance at our weekly meetings.

The auditorium is on the second floor. It is equipped with 200 opera chairs, raised stage, exhaust fans for cigarette smoke, public address system and other conveniences. The walls of the auditorium display photographs of all past presidents of the Society, including two whose names are on our eighty-one-year old charter, Dr. George Cupples and Dr. Ferdinand Herff.

The business activities of the Society are in a quiet wing of the second floor. These comprise a telephone exchange, nurses' registry, information and credit bureau and two monthly periodicals: *Southwest Texas Medicine*, which goes to the physicians of Southwest Texas, and *Health and Happiness*, which has a lay circulation of 6,000. These are owned and operated by the Society and employ a manager, a librarian and six assistants.

Texas, and particularly San Antonio, expect the Southern Medical Association in November. The organized medical profession of the City is ready and eager to welcome its guests.

After San Antonio, Mexico

INTERIOR MEXICO*

The Valley of Mexico, which surrounds and includes Mexico City, is the center of modern Mexico, as it was the center of the ancient kingdom of the Aztecs. Virtually all of the places and things that the traveler has heard of in Mexico, and will want to see, are in this valley, or are not far removed from it. The valley itself may have been, at one time, the floor of a huge volcano. Today it is a magic depression between the ranges of the Sierra Nevadas on the west and the Sierra Madres on the east, with a rich soil, an even climate and all the facilities for recreation and entertainment that the most exacting visitor could demand.

The famed pyramids of San Juan Teotihuacan are at the northeastern extremity of the valley, with the broad expanse of Lake Texcoco lying between them and Mexico City. The drive to these mysterious reminders of an ancient civilization, which requires little more than an hour, starts from the heart of the City, goes through Guadalupe, and, skirting the western shore of Texcoco, takes the visitor across the valley to San Juan Teotihuacan. At Guadalupe is one of the most interesting churches in Mexico, one that should be seen either on the going or the returning pyramid trip. This church is one of the most famous and revered shrines in the Americas. The magnificent church on the hill and the Chapel of the Well both commemorate the miraculous visitation of the Virgin Mary to an humble Indian convert just ten short years after the Conquest. Every year since that time, to this day, the devout and impressionable Indians make a pilgrimage to this place on the anniversary of the miracle, as the Mohammedans go to Mecca.

The pyramids at San Juan Teotihuacan antedate even the glory of the Aztec Empire. Although it is only the excavations of the last twenty years that have brought the full size of these huge structures into view, their presence has been known and marveled at for centuries. The largest of the structures is the Pyramid of the Sun, towering to a height of 216 feet and composed of five pyramidal sections, imposed one upon another, that may be mounted on a series of rough stairways. About a half-mile to the north is the Pyramid of the Moon, slightly smaller than that of the Sun, with the Camino de los Muertos, or Path of the Dead, connecting them. This splendidly barbaric group,

Pyramid of the Sun at San Juan Teotihuacan, Mexico.

according to the archeologists and historians who have unearthed and studied it, once dominated a large and flourishing city of which it was the center. These pyramids are larger at the base than those of Egypt, and are thought to be older, historians believing them to have been mouldering ruins before the birth of Christ.

Another trip of great interest to be made from Mexico City is to Puebla. It is about 85 miles to Puebla from Mexico City, on the Great Central Plateau at the southeastern edge of the Valley of Mexico, a morning's drive over a wonderful mountain highway rising to nearly twelve thousand feet, or nearly five thousand feet higher than Mexico City. A point of interest en route to Puebla is the village of San Martin, where on Tuesday of each week the Indians for miles around come in for market day, the open air market occupying a space of about two city blocks. Everything imaginable is on sale at these Indian markets. One of the most interesting things that one sees in Mexico

*Much of the data for this story was furnished, and most of the preparation of the story was done, by the Publicity Department of the Missouri Pacific Lines.

**Editor's Note.*—The Secretary-Manager of the Southern Medical Association announces an official personally conducted trip to Mexico following the San Antonio meeting, and the points mentioned in this story will all be visited. The trip to Puebla will be made on Tuesday in order to visit the Indian market at San Martin.

is these Indian markets. Another point of interest on the way to Puebla is the City of Cholula, the former religious capital of the Aztecs, where a great number of their temples stand. During the march on Mexico City, Cortez subdued the Cholulans and forced them to build three hundred and sixty-five churches, all of magnificent proportions and intricate artistry, one for every day of the year, to atone for their excesses in human sacrifice. From Cholula the road winds through an interesting countryside until it reaches the City of Puebla. Puebla was the first city founded by the Conquerors in Mexico, and it was founded with a dual purpose: to serve as a more healthful home city than the capital, and to be an intermediate stronghold closer to their base of supplies at Veracruz. There are more than sixty beautiful cathedrals in the City as well as many splendid public buildings. Many of the homes and other buildings are reminiscent of the extravagantly beautiful architecture introduced into Spain by the Moors and transplanted to the New World by the luxury loving colonists. At one time the City was second only to Mexico City and it is still an important commercial as well as political center.

On the road to Puebla will be seen the two noted year-round snow-capped mountains, Popocatepetl and Ixtlaccihuatl, the latter more popularly known as the "Sleeping Lady." Popocatepetl is a volcano which is active at times, and if the day is clear a film of smoke may be seen arising from its crater.

One of the trips that every visitor to Mexico City should make is to Xochimilco. It has three main canals and a network of smaller ones bisecting them that wind between the "floating" islands that make up the area. These islands are covered with flowers of many colors and scents. To enjoy fully this attractive spot, the visitor should engage a boat and be floated at his leisure through the maze of canals, past the rioting flowers on the islands and the merrymaking groups in the other boats that throng the waterways. There are attractive outdoor restaurants where meals may be had, or the visitor may have his meal served in his boat from other boats that will draw alongside.

Cuernavaca, almost directly south of Mexico City, is reached in about two hours by automobile from the capital, over a picturesque road that winds to a height of ten thousand feet above the valley, and then abruptly drops to five thousand feet, which is the altitude of this ancient city. Cuernavaca is interesting to the visitor for several reasons: first, that it was the chosen home of Cortez after the stirring days of the Conquest when the Great Captain sought the peace and quiet of retirement. The palace where he lived is still used as the seat of the state legislature and for the local government offices. It is believed to be the oldest building on the American Continent. Another reason for its great interest is that here are located the Borda Gardens, a magnificent formal garden built at great expense and through the patriotic fervor of Joseph le Borda, an expatriated Frenchman who made a tremendous fortune in Mexico and sought to give his adopted land a garden that would rival the splendor of Versailles. Another reason is that its climate, its health and pleasure facilities and its scenery make it one of the most popular of Mexican resorts.

The late Ambassador Morrow had a home at Cuernavaca, and it was here in this home that Colonel Lindbergh first saw and met Miss Anne Morrow, who later became Mrs. Lindbergh, this following his non-stop flight to Mexico City soon after his successful flight across the Atlantic Ocean.

Book Reviews

Surgery of a General Practice. By Arthur E. Hertzler, M.D., Chief Surgeon, Halstead Hospital; Professor of Surgery, University of Kansas, and Victor E. Chesky, M.D., Chief Resident Surgeon, Halstead Hospital. 602 pages, illustrated. St. Louis: The C. V. Mosby Company, 1934. Cloth, $10.00.

The technics propounded are neither elaborate nor is the surgery selected beyond the skill of the well trained practitioner of today. All the work can be done in the office or home without trained assistance. It is regrettable that the writers do not mention gas gangrene serum; do not appear to be cognizant that any physician can give anti-rabies serum, it being no longer necessary to send these patients to laboratories; *B. diphtheriae* is not spoken of as a cause of ulcers; neoarsphenamine intravenously is not given in the treatment of Vincent's angina, and transillumination and roentgen examination in the diagnosis of breast tumors are omitted. The surgically inclined practitioner will find in this volume a large amount of work that he himself can do.

That Heart of Yours. By S. Calvin Smith, M.D., Sc.D., Author of "Heart Affections: Their Recognition and Treatment," "Heart Records: Their Interpretation and Preparation," "How is Your Heart?". 212 pages, illustrated. Philadelphia: J. B. Lippincott Company, 1934. Cloth, $2.00.

This book is designed for laymen suffering from diseases of the heart. After a section dealing with structure and function several chapters are devoted to heart disease of the various age periods. Another chapter is concerned with the early symptoms of cardiac disease and the final section of the book is devoted to a consideration of therapy.

In some respects the work can be highly recommended. It tends to reassure patients with cardiac disease and to convince them that their disorder is not necessarily likely to lead to death in the near future. Such a point of view is especially important, since the newspapers are filled with reports of persons dying of cardiac disease and never mention the fact that such patients have frequently lived for many years in comfort with seriously diseased hearts. For the educated, apprehensive patient who is interested in medicine and inclined to be introspective the book may be useful. The discussion of blood pressure is especially sensible.

A Text-Book of Pharmacology and Therapeutics, or the Action of Drugs in Health and Disease. By Arthur R. Cushny, M.A., M.D., LL.D., F.R.S., late Professor of Materia Medica and Pharmacology in the University of Edinburgh. Tenth Edition, Thoroughly Revised by C. W. Edmunds, A.B., M.D., Professor of Materia Medica and Therapeutics in the University of Michigan, Ann Arbor, Michigan, and J. A. Gunn, M.A., M.D., D.Sc., Professor of Pharmacology in the University of Oxford, Oxford, England. 786 pages, illustrated. Philadelphia: Lea & Febiger, 1934. Cloth, $6.50.

The tenth edition of this book is the second under the authorship of Drs. Edmunds and Gunn. Among the important additions are the liver and stomach preparations in the treatment of primary anemia and the inclusion of a great number of new hypnotic agents. The section on the therapeutic uses of drugs is placed immediately after the discussion of their pharmacological action. A short sketch of Dr. Cushny's life has been included in the forepart of the book. It is a thoroughly adequate text for teaching or reference.

Paralysis in Children. By R. G. Gordon, M.D., D.Sc., F.R.C.P. (Ed.), Physician, Bath and Wessex Orthopedic Hospital, London; and M. Forrester Brown, M.D., M.S. (Lond.), Surgeon, Bath and Wessex Orthopedic Hospital. 328 pages, illustrated. New York and London: Oxford University Press, 1933. Cloth, $4.50.

This book, written from the combined standpoint of the orthopedist and neurologist, is divided into three parts: general, clinical, and treatment. Under physiology of movements are discussed the biochemical source of energy, the function of muscle, and the function of the nervous system as related to posture and movement. The authors go into Ramsay Hunt's theories and discuss the nervous mechanism underlying the function of posture and motion. Diagrams illustrate the situation in the nervous system of the lesions which underly paralyses.

The principal causes of paralysis in children are listed as developmental defects, injuries, inflammation, and tumors.

This should be a valuable book for anyone who sees children in his practice, no matter what his special field may be.

Neurology. By Roy R. Grinker, M.D., Associate Professor of Neurology, the University of Chicago. 979 pages, illustrated. Springfield, Illinois: Charles C. Thomas, 1934. Cloth, $8.50.

This is not simply a text of clinical neurology, but a comprehensive study of the nervous system. The subjects of embryology, anatomy, and physiology are dealt with before the clinical discussion. The author has not presented neurology as a part of general medicine, but rather as general medicine and more.

The subject of clinical neurology is thoroughly and practically presented. The illustrations are well chosen as to subject and number. They are sufficient, and the work is not over-illustrated. The student or the clinician will find this book a gratifying addition to his library.

A Diabetic Manual for the Mutual Use of Doctor and Patient. By Elliott P. Joslin, M.D., Clinical Professor of Medicine, Harvard Medical School; Medical Director George F. Baker Clinic for Chronic Disease at the New England Deaconess Hospital; Consulting Physician, Boston City Hospital, Boston, Massachusetts. 224 pages, illustrated. Philadelphia, Pennsylvania: Lea & Febiger, 1934. Cloth, $2.00.

The fifth edition of Joslin's "Diabetic Manual" brings this standard text-book for diabetics up to 1934. Joslin once said: "The diabetic who learns most about diabetes will live the longest;" and if the patient with uncomplicated diabetes will learn and live by the knowledge contained in this little book, he will add years to his life and be happier and more efficient than if he did not have a crippled pancreas. Joslin's "Diabetic Manual" contains information that should be familiar to every practitioner of medicine. Indeed, any physician, even the diabetic specialist, will find it worthwhile reading this revised and almost completely rewritten edition when he provides his diabetic patient with a copy. Diabetic handbooks by many authors come and go, but Joslin's "Diabetic Manual" deservedly, like Tennyson's "Brook," "goes on forever."

The Anemias. By Janet M. Vaughan, D.M. Oxon., M.R.C.P., Lond.; Beit Memorial Fellow, the Bernhard Baron Institute of Pathology; Rockefeller Traveling Fellow, The Thorndike Memorial Laboratory, Boston City Hospital, Boston, U.S.A. With Notes on Normal and Pathological Erythropoiesis. By Huber M. Turnbull, D.M. Oxon, F.R.C.P. Lond. Director of the Bernhard Baron Institute of the London Hospital. 248 pages, illustrated. New York: Oxford University Press, 1934. Cloth.

This is a good review of the subject for reference and for classification. The style is tabulatory. The facts are accurate.

Nephritis and Allied Diseases. Their Pathogeny and Treatment. By Robert Platt, M.D. (Sheff.), M.R.C.P. (Lond.); Physician, Royal Infirmary, Sheffield; Visiting Physician, Montagu Hospital, Mexborough. 166 pages, illustrated. New York: Oxford University Press, 1934. Cloth.

The author summarizes the most important clinical features of Bright's disease. He makes no attempt at a comprehensive review of all phases of the subject and includes references only to the most important work. The material is well arranged and clearly written. Recent advances in the physiology of the kidney are discussed in so far as they bear on clinical aspects of the subject. The practical aspects of renal function tests are presented. The author's classification is based on the fundamental clinical descriptions of Bright and careful clinical and pathological observations of Volhard and Fahr, and the more recent studies of Van Slyke and of Addis. He tries to remove unnecessary complexity from the subject, but does not make the mistake of many authors of attempting to overemphasize a subject which by its very nature is rather complex. The clinical description of the various types of renal disease is very well presented.

A Text-Book of Bacteriology. By Hans Zinsser, M.D., Professor of Bacteriology and Immunology, Harvard University Medical School, and Stanhope Bayne-Jones, M.D., Professor of Bacteriology, Yale University Medical School; Master of Trumbull College, Yale University, New Haven, Connecticut. Rewritten, revised and reset. Seventh Edition. 1226 pages, illustrated. New York: D. Appleton-Century Company, 1934. Cloth, $8.00.

The authors have restricted this well known book to the fundamental science of bacteriology. Their wide experience enables them to discuss with authority the relationships and changing concepts between the old and the new knowledge. The chapters on the bacteriology of milk, soil and water have been deleted and the studies on pathogenic protozoa have been reduced to a mere outline. The greater part of the instructions for technical work are given in the last pages of the book and are very minute as to detail. This excellent text has long been a standard in its field.

Applied Physiology. By Samson Wright, M.D., F.R.C.P., John Astor Professor of Physiology, University of London Middlesex Hospital Medical School; Examiner in Physiology to the University of Oxford and the Royal College of Surgeons of England. 604 pages, illustrated. New York: Oxford University Press, 1934. Cloth.

This book contains the latest information, is accurate and brief. Five editions have appeared in the past eight years. The revisions are quite extensive, embracing the greater part of the text. The book is adaptable as an abridged reference or for teaching.

Diseases Peculiar to Civilized Man. Clinical Management and Surgical Treatment. By George Crile, M.D. Edited by Amy Rowland. 426 pages, illustrated. New York: The Macmillan Company, 1934. Cloth, $5.00.

Dr. Crile introduces the postulate that such diseases as hyperthyroidism, neurocirculatory asthenia, peptic ulcer, probably diabetes and other allied conditions are produced by a malfunction of organs that are affected by the brain-thyroid-suprarenal-sympathetic system. And as these diseases are found only in civilized man, they are peculiar to this state of living. He believes that if the suprarenals are denervated the excessive secretion from these glands will no longer cause a physiological imbalance of the system. In some cases a thyroidectomy was done in addition.

Reports embrace 307 cases operated upon in the past 21 years. In neurocirculatory asthenia 94 per cent of the patients were cured or improved, 93.7 per cent in hyperthyroidism, and 96.4 per cent in peptic ulcer.

Southern Medical News

AMERICAN ASSOCIATION FOR THE STUDY OF NEOPLASTIC DISEASES

The recently organized American Association for the Study of Neoplastic Diseases will meet at the Mayflower Hotel, Washington, District of Columbia, September 6, 7 and 8. There will be two sessions on lantern slide demonstration of microscopic pathology, two sessions on radiologic diagnosis, and three on surgery and radiation therapy in neoplastic diseases. Chairmen of tha several sessions will be Dr. Joseph Colt Bloodgood, Baltimore, Maryland; Dr. Wright Clarkson, Petersburg, Virginia; Dr. James F. Kelly, Omaha, Nebraska; Dr. J. Shelton Horsley, Richmond, Virginia; Dr. E. A. Merritt, Washington, District of Columbia; and Dr. Max Cutler, Chicago, Illinois. All persons interested are invited to attend.

ALABAMA

Dr. John Howard Ferguson, recently of Yale University, has been named to succeed Dr. Gene H. Kistler as Assistant Professor of Physiology and Pharmacology at the University of Alabama School of Medicine.

Dr. Gene H. Kistler, University, who recently was awarded the Joseph A. Capps Prize of $500.00 by the Institute of Medicine of Chicago, is transferring to the Department of Pathology and Bacteriology of the University of Alabama School of Medicine, University, where he will be Associate Professor.

Dr. Albert Sydney Harris, Banks, is the newly appointed Instructor in Physiology and Pharmacology at the University of Alabama School of Medicine, University.

Dr. Charles A. Mohr, Mobile, recently resigned as Health Officer of Mobile County.

Dr. Robert L. Allen has succeeded Dr. William S. Bean, Jr., as Medical Officer in Charge of the Marine Hospital at Mobile.

DEATHS

Dr. David Christian Batson, Birmingham, aged 56, died May 17.

Dr. William Fletcher Penn, Tuskegee, aged 62, died May 31 of chronic myocarditis.

Dr. Laban Benjamin Underwood, Andalusia, aged 39, died May 13 of injuries received in an automobile accident.

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- Richard states:—"To say the use of Lipiodol as an aid in the study of pulmonary disease has been a tremendous boon to both roentgenologists and internists and has greatly increased the accuracy of roentgen interpretation is an obvious platitude . . . " (Amer. Jour. of Roent. and Rad. Ther.)
- Sicard and Forestier report that Lipiodol possesses noteworthy therapeutic properties.
- Ballon suggests the use of Lipiodol in roentgenographic study of various forms of pulmonary tuberculosis, tuberculosis after thoracoplasty, pulmonary fistula, asthma, etc.

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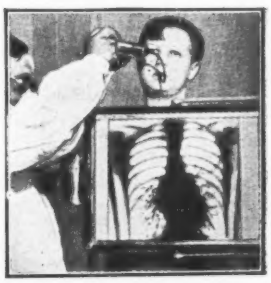
Case of extensive cylindrical bronchiectasis as shown with LIPIODOL (Richards; Am. J. Roentgenology and Radium Therapy, Vol. XXX, No. 3, Sept., 1933).



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ARKANSAS

Dr. E. F. Ellis, Fayetteville, was recently honored by the University of Arkansas, when he had the honorary degree of Doctor of Laws conferred upon him by the University, Dr. Ellis having completed fifty years of active practice, with more than thirty years spent in Fayetteville.

Dr. Henry G. Hollenberg, Little Rock, recently Resident in Surgery at the Cincinnati General Hospital, has joined the surgical staff of the Clifton Springs Sanitarium and Clinic, Clifton Springs, New York.

Dr. J. E. McGuire, Piggott, has been taking postgraduate work at the New York Polyclinic this summer.

Dr. D. A. Rhinehart, Little Rock, was made a Fellow in the American College of Radiology at their convocation in Cleveland recently.

Dr. J. H. McCurry, Cash, was host to physicians of his District at a fish fry in June.

Dr. R. B. Robins, Camden, recently took postgraduate work at the University of Indiana and the University of Michigan.

Dr. A. C. Shipp, Little Rock, was recently reelected Director of the National Tuberculosis Association.

Dr. S. F. Hoge, Little Rock, made an address before the staff and visitors at Hines Hospital, Chicago, during the recent meeting of the American College of Physicians.

Dr. W. E. Hamil, Pocahontas, announces the opening of a four-bed hospital at his office.

The Ninth Councilor District Medical Society, at a recent meeting at Eureka Springs, elected the following officers for the coming year: Dr. J. I. Thompson, Yellville, President; Dr. D. L. Owens, Harrison, First Vice-President; Dr. D. K. McCurry, Green Forest, Second Vice-President; and Dr. J. H. Fowler, Harrison, Secretary-Treasurer.

Deaths

Dr. George Edward Penn, Marvell, aged 69, died May 31 in a Memphis, Tennessee, Hospital.

Dr. Harry Homer Goyer, North Little Rock, aged 48, died May 12.

Dr. James A. Davis, Little Rock, aged 64, died May 19 of diabetic gangrene and chronic interstitial nephritis.

Dr. Charles E. Gosnell, Bingen, aged 64, died May 28 of nephritis.

Dr. Miles Dawson Kelly, Lonoke, aged 54, died June 11.

Dr. David A. Hutchinson, Nashville, aged 85, died May 27.

DISTRICT OF COLUMBIA

The District of Columbia Medical Society is the recipient of a $6,000.00 bequest through the will of the late Dr. George Martin Kober, income from this fund to be used for the relief of old or infirm physicians.

The Kober Medal, awarded each year for high scientific achievement in the field of medical research, was presented this year to Dr. J. J. Abel, Professor of Pharmacology, Johns Hopkins University, Baltimore, announcement of the award being made at the Kober Day Celebration and Lecture in the early spring. The medal was presented at the annual meeting of the Association of American Physicians.

Dr. Elizabeth A. Kittredge, Washington, is the newly elected President of the Women's Medical Society of the District of Columbia.

The Washington Heart Association, at its recent meeting, elected the following officers for the coming year: Dr. Sterling Ruffin, President; Dr. Wallace M. Yater, Vice-President; Dr. James W. Esler, Secretary; and Mr. Samuel M. Kauffmann, Treasurer; all of Washington.

The Louis Mackall Medical Society held its annual banquet recently. New officers for the coming year are: Dr. William W. Chase, President; Dr. Frank D. Costenbader, Vice-President; and Dr. Richard W. Wilkinson, Secretary-Treasurer; all of Washington.

The Section on Internal Medicine of the District of Columbia Medical Society announces the following officers for the coming year: Dr. Bernard W. Leonard, Chairman; Dr. Fred A. J. Geier, Vice-Chairman; and Dr. A. J. B. Connolly, Secretary-Treasurer; all of Washington.

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Radiograph revealing fracture through neck of coronoid process.

TRAFFIC accidents, industrial accidents, acts of violence bring physicians numerous cases of head injuries. Even though the conditions may be obviously serious, the physical findings may not point to fractures of the jaws. Yet such injury is common in these cases, and early treatment is imperative.

Therefore, a comprehensive radiographic examination should be made as soon as the patient's condition permits. The possibility of mandibular fractures always should be considered . . . Several radiographs should be made to determine whether they are present. Since one-third of such fractures are double, both right and left sides should be examined.

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Continued from page 20

Dr. Darrell C. Crain, Jr., Washington, and Miss Louise Moore were married July 12.

DEATHS

Dr. Frederick C. Ainsworth, Washington, Major General, U. S. Army, retired, aged 81, died June 5 of bronchopneumonia and arteriosclerosis.

Dr. John Edgar Walsh, Washington, aged 69, died June 22 of cerebral hemorrhage.

Dr. Sterling Buckner Ragsdale, Washington, aged 49, died July 3 from drowning.

Dr. Edward Grant Seibert, Washington, aged 69, died June 30.

FLORIDA

The Central Florida Medical Association, composed of physicians of Alachua, Marion, Lake, Hernando and Citrus Counties, held its semi-annual meeting in June and elected the following officers for the coming year: Dr. T. H. Wallis, Ocala, President; Dr. George A. Dame, Inverness, Dr. C. M. Tyre, Eustis, Dr. John E. Maines, Jr., Gainesville, Vice-Presidents; and Dr. James L. Strange, McIntosh, Secretary-Treasurer.

The Jackson Memorial Hospital, Miami, has been approved by the Council on Medical Education of the American Medical Association for the training of residents in medicine and surgery.

Dr. Maximilian Stern, Daytona Beach, has moved into new offices at 223 Ocean Boulevard, with practice limited to urology.

Dr. Ruth S. Hart, Winter Park, has been in Baltimore and New York doing postgraduate work.

Dr. Simon E. Driskell, Jacksonville, is the newly elected President of the Florida State Board of Medical Examiners; Dr. Horace A. Day, Orlando, was elected Vice-President; and Dr. William M. Rowlett, Tampa, was reelected Secretary.

Dr. Walter G. Miles, Orlando, was made a Fellow in the American Psychiatric Association at its recent meeting in New York.

Dr. B. A. Burks, Winter Park, is doing postgraduate work in New York.

DEATHS

Dr. Grover Cleveland Miller, Chipley, aged 47, died April 7.

Dr. Walter Ervin Seay, Jacksonville, aged 61, died May 11 of perforated ulcer of the stomach.

Dr. Leroy S. Barnes, Lynn Haven, aged 92, died April 21.

GEORGIA

The Ware County Medical Society sponsored a series of postgraduate lectures which were given at Waycross four afternoons during the week of July 2.

Dr. G. W. Willis, Ocilla, was honored recently when he was given a shower by people of Ocilla and Irwin Counties and was presented with gifts for his new hospital, which is nearing completion.

Dr. L. Minor Blackford, Atlanta, has been elected President of the Atlanta Clinical Society to succeed Dr. Joseph C. Massee. Dr. Vernon E. Powell is Vice-President; and Dr. W. H. Kiser, Jr., Secretary.

The Atlanta Cancer Clinic was formally opened and dedicated recently. This clinic is located at the Georgia Baptist Hospital.

Dr. J. T. McCall, Rome, recently entertained members of the Floyd County Medical Society at a barbecue at his camp on Big Cedar Creek.

Dr. W. L. Mathews, Winder, is the newly elected President of the Alumni Association of Emory University School of Medicine; and Dr. Marion C. Pruitt, Atlanta, was reelected Secretary-Treasurer.

Dr. Ralph McCord, Rome, has been appointed House Physician in the Department of Ophthalmology, Laryngology and Rhinology at Grady Hospital, Atlanta, after having completed a year of rotating service at the Piedmont Hospital.

Dr. J. K. Fancher, Atlanta, was recently elected to Fellowship in the American College of Physicians.

Dr. J. R. Garner, Atlanta, is the newly appointed Visiting

Continued on page 24

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Dallas Southe n Clinical Society Meets March 18-22, 1935.

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Professor of Forensic Medicine at the University of Georgia Medical Department, Augusta. Dr. Garner was recently elected First Vice-Chairman of the Medical and Surgical Section of the American Railway Association.

Dr. Hal M. Davison, Atlanta, was recently elected to Fellowship in the American Therapeutic Society.

Dr. Newdigate M. Owensby, Atlanta, is the newly appointed Professor of Psychiatry at the University of Georgia Medical Department, Augusta.

Dr. W. Earl Quillian, Atlanta, was elected International President of the Civitan Club at its recent annual meeting in Canada.

The Clarke County Medical Society, Medical Association of Georgia, Emory University School of Medicine, and University of Georgia Medical Department sponsored a postgraduate extension course which was held in Athens July 30 through August 3.

Dr. L. L. Whitley, Crawford, was host recently to members of the Clarke County Medical Society at a barbecue at his summer camp near Winterville.

Dr. and Mrs. T. H. Brabson, Cornelia, were hosts recently to members of the Habersham County Medical Society and the Auxiliary.

Dr. Thomas J. Charlton, Savannah, is the newly elected Assistant Commissioner of Health of Chatham County.

Dr. J. R. McCord, Atlanta, is the newly elected Chairman of the Section on Obstetrics of the American Medical Association.

Dr. Needham B. Bateman, Jr., Atlanta, has opened offices at 523 Candler Building for the practice of medicine and surgery.

Dr. Jack Jones, Atlanta, is a newly elected Fellow in the American Dermatological Society.

Atlanta physicians gave a series of postgraduate lectures at Carrollton during the week of July 9-13.

Dr. Charles Edward Dowman, Jr., Atlanta, and Dr. Cordelia Koch were married June 14.

DEATHS

Dr. James Wilson Clements, Subligna, aged 94, died June 5 of acute gastritis.

Dr. Jonathan Evans Clark, Ringgold, aged 84, died May 9 of pernicious anemia.

Dr. Malcolm M. Crowder, Kensington, aged 74, died May 7.

Dr. James A. Stothart, Savannah, aged 80, died May 13 of cerebral hemorrhage.

Dr. Joseph A. Farmer, Milstead, aged 76, died May 15.

Dr. William W. Pirkle, Cumming, aged 64, died suddenly June 8 of heart disease.

Dr. Arthur J. Griffith, Comer, aged 57, died May 29 of acute dilatation of the heart.

Dr. George W. Wallis, Fayetteville, aged 73, died June 17.

Dr. William David Dorminy, Fitzgerald, aged 63, died June 4.

Dr. Albert S. J. Stovall, Elberton, aged 72, died June 21.

Dr. George W. Burnett, Whitesburg, aged 81, died June 19.

KENTUCKY

The Kentucky State Medical Association is completing plans for the annual meeting to be held at Harlan October 1-4.

The Adair County Medical Society has elected the following officers for the coming year: Dr. B. J. Bolin, President; Dr. N. A. Mercer, Secretary and Treasurer; both of Columbia.

The Graves County Medical Society has elected the following officers for the coming year: Dr. E. A. Stevens, President; Dr. W. H. Fuller, Vice-President; and Dr. H. H. Hunt, Secretary-Treasurer; all of Mayfield.

Dr. Herbert W. Wortham and Miss Margaret McShane, both of Louisville, were married June 4.

DEATHS

Dr. Charles B. Duerson, Mount Sterling, aged 63, died June 12.

Dr. Addison S. Robertson, Flemingsburg, aged 66, died April 15 of angina pectoris.

Dr. Frank'in Pierce Tilford, Nebo, aged 81, died in March.

Dr. William McGlasson Corey, Erlanger, aged 68, died May 29 of angina pectoris.

Dr. Charles Wilbur Stroup, Ludlow, aged 54, died May 26 of coronary embolism.

Dr. John H. Stigall, Burnside, aged 72, died May 28 of cerebral hemorrhage.

Dr. William McKinley Ison, Edmonton, aged 34, died May 13.

Continued on page 26

Phyllicin

the new theophylline salt

Phyllicin is a potent diuretic and cardiac stimulant in doses of 1 tablet two to four times a day, after meals. Prescribe Phyllicin to relieve cardiac distress and reduce edema of cardiac or nephritic origin ...

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In anorexia, when children refuse to eat, reason dictates that the little food they *do* take be as nutritious—as concentrated as possible.

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Klim, the powdered whole milk (all the milk except the water), can be added to numerous staple dishes without increasing their bulk or affecting flavor, texture, or balance. The Klim cookbook (Reinforced Diet Recipes) provides the pediatrician with a practical, easily explained means of prescribing a concentrated diet. It is available to you in any quantity for patient distribution. A supply will be gladly sent on request, together with samples of Klim.

A Typical Recipe from *"Reinforced Diet Recipes."*

BOILED RICE

¼ cup rice
6 tablespoons KLIM
½ teaspoon salt
1 cup water

Mix rice and KLIM and salt together. Gradually add the water and stir. Cover and cook over boiling water ¾ hour, or until rice is tender and milk absorbed. Volume 1¼ cups.

This recipe furnishes ½ cup of milk (84 calories) over normal recipe.

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Cambridge, Mass. Cincinnati, Ohio Detroit, Mich.
St. Louis, Mo. St. Paul, Minn.

Continued from page 24

LOUISIANA

Dr. Oscar Walter Bethea, New Orleans, Professor of Clinical Medicine of Tulane University, recently received the degree of Master of Pharmacy at the annual commencement of the Philadelphia College of Pharmacy and Science.

Dr. Charles J. Bloom, New Orleans, on the faculty of the Graduate School of Medicine of Tulane University of Louisiana, recently conducted a preschool clinic at Bay St. Louis, Mississippi, under the auspices of the Parent-Teachers' Association, the U. S. Public Health Service, and the County Health Office.

Dr. Frederick L. Fenno, New Orleans, is doing postgraduate work at the University of Chicago.

Dr. John H. Musser, New Orleans, was appointed on the Council of Medical Education of the American Medical Association to fill the vacancy made by the election of Dr. James S. McLester as President-Elect.

Dr. H. W. E. Walther, New Orleans, was chosen Chairman of the Section on Urology.

Deaths

Dr. George Farrar Patton, New Orleans, aged 81, died April 2.

Dr. Ernest Joseph Cather, Oakdale, aged 56, died May 27 in a New Orleans hospital of adenoma of the prostate, chronic myocarditis and aneurysm of the aorta.

Dr. Henry Bayon, New Orleans, aged 68, died in April of coronary thrombosis.

Dr. Isaac Posnainsky, New Orleans, aged 55, died May 8 of chronic myocarditis, nephritis and diabetes mellitus.

Dr. Harry Everett Nelson, New Orleans, aged 48, died May 16 of sarcoma.

Dr. Samuel Lawrence Joyner, Ashland, aged 58, died May 28 in a Shreveport sanatorium of chronic nephritis.

Dr. Frank Anderson Overbay, New Orleans, aged 51, died suddenly May 10 of heart disease.

MARYLAND

Dr. J. J. Abel, Baltimore, Professor of Pharmacology, Johns Hopkins University, was awarded the 1934 Kober Medal, presented each year by the Kober Foundation of Georgetown University School of Medicine, Washington, for high scientific achievement in the field of medical research.

Dr. H. E. Sigerist, Baltimore, Professor of Medical History, Johns Hopkins University School of Medicine, recently lectured in the Duke Hospital amphitheatre, Durham, North Carolina. Dr. Sigerist also gave the Alpha Omega Alpha address.

Dr. Robert W. Johnson, Jr., Baltimore, Assistant Professor of Orthopedic Surgery, Johns Hopkins University School of Medicine, recently lectured at Duke Hospital, Durham, North Carolina.

Deaths

Dr. Winston Rives Haynes, Silver Spring, aged 42, died suddenly June 8 of heart disease.

Dr. Burton Dwight Stone, Baltimore, aged 74, died May 13 of carcinoma of the prostate.

Dr. Louis Ignatius Turner, Baltimore, aged 77, died suddenly May 9 of lobar pneumonia and myocarditis.

MISSISSIPPI

The Epidemiological Unit of the Mississippi State Board of Health recently inaugurated a program of communicable disease control in Leflore County in cooperation with the local Health Department, with Dr. A. L. Gray as Director.

The Bay St. Louis Parent-Teachers' Association, County Health Office, and U. S. Public Health Service recently sponsored a preschool clinic, which was conducted by Dr. Charles J. Bloom, New Orleans, on the faculty of the Graduate School of Medicine, Tulane University.

Dr. James M. Acker, Jr., Aberdeen, is the newly appointed Superintendent of the Mississippi State Hospital at Jackson, succeeding Dr. Charles D. Mitchell.

Dr. Byron H. Paslay, Como, is the newly appointed Surgeon of the State Penitentiary, succeeding Dr. William P. McDavid, deceased.

Dr. Russell R. Welch, Jackson, is the newly appointed Superintendent of the East Mississippi Insane Hospital at Meridian, succeeding Dr. Matthew J. L. Hoye.

Dr. Loren Wallin, Natchez, has resigned as Health Officer of Adams County to devote his time to the private practice of children's diseases in Natchez.

Dr. J. Rufus Johnson has opened offices in Jackson for the

Continued on page 28

We quote from page 54 of

"The Milk Question"

by M. J. ROSENAU, Professor of Preventive Medicine and Hygiene, Harvard Medical School.

"Man has but a single stomach and this forms about twenty per cent of the digestive tract. The cow has four stomachs which form about seventy percent of the digestive tract. The calf's stomach is well fitted to handle and digest the tough, lumpy curds which form from cow's milk. Woman's milk curdles into a soft mass which is broken into numberless small particles. Evidently the stomach of the infant fed with cow's milk is over-taxed trying to break the tough curds into particles small enough for complete digestion. It is therefore evident that even if we could secure cow's milk, the chemical composition of which was exactly the same as that of human milk, it would still be far from a perfect substitute unless it behaved similarly in the digestive tract."

SIMILAC is similar to breast milk not only in composition but in digestive properties as well. Like breast milk it forms an extremely fine, soft curd of consistently zero curd tension.

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Notably Ulcers

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Horlick's Malted Milk, made with either milk or water, is an alkaline food, which is accordingly beneficial in an alkaline diet.

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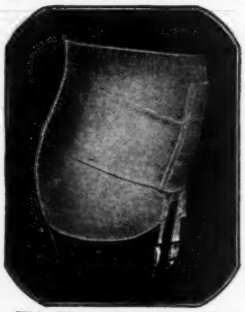

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Continued from page 26

practice of kidney and bladder disorders, having completed postgraduate work in New York.

Dr. Jack Kellem has located in Tupelo for the practice of eye, ear, nose and throat diseases.

Dr. S. B. Caruthers has located at Grenada and is associated with the Grenada Clinic.

Dr. F. M. Acree, Greenville, is taking a three months' postgraduate course at the University of Heidelberg.

Dr. J. Walton Lipscomb, formerly of Columbus, and Miss Ann Elizabeth DuBard were married June 6. Dr. Lipscomb has located at Jackson for the practice of surgery and obstetrics.

Dr. H. L. Murphy, Arkabutla, and Miss Mosy Campbell were married in May.

Dr. W. M. Adams and Miss Catherine Taylor, both of Booneville, were married in May.

DEATHS

Dr. William Paul McDavid, Parchman, aged 48, died April 24 in a Memphis hospital.

Dr. Sam F. Love, formerly of Morgan City, aged 76, died May 16.

Dr. C. M. Cook, Preston, died recently.

MISSOURI

The Kansas City Southwest Clinical Society announces its twelfth annual fall clinical conference to be held at Kansas City October 1 to 4.

Dr. H. I. Spector, St. Louis, is the newly appointed Assistant Health Commissioner of St. Louis, succeeding Dr. Paul J. Zentay, resigned.

Dr. C. C. Dennie, Kansas City, was recently appointed a member of the American Board of Dermatology and Syphilology.

Dr. Hugh L. Dwyer, Kansas City, is the newly elected President of the American Association of Medical Milk Commissions.

The St. Louis Medical Society was recently presented with a plaque in memory of Dr. William Carr Lane, first Mayor of St. Louis, and of his two grandsons, Dr. William Carr Glasgow and Dr. Frank Adams Glasgow. The plaque hangs in the Library of the St. Louis Medical Society Building.

The Louise G. Wallace Hospital, Lebanon, funds for the erection and maintenance of which were provided for in the will of the late Mrs. Louise G. Wallace, was formally dedicated July 1.

Dr. W. McKim Marriott, St. Louis, Dean of the Washington University School of Medicine, is visiting various universities in Germany during the summer.

Dr. Jerome J. Bredall, Perryville, and Miss Mary Katherine Lacey were married June 30.

DEATHS

Dr. Orlando G. Gibson, St. Louis, aged 61, died suddenly May 30 of heart disease.

Dr. Ulysses Eugene Hartley, St. Louis, aged 42, died June 6.

Dr. Lonzo Abner Duck, Webster Groves, aged 55, died May 18 of heart disease.

Dr. James M. Adkins, Liberty, aged 76, died June 2.

Dr. John P. Neely, New London, aged 80, died March 31 of cerebral embolism.

Dr. Charles Chandler Parmer, Centralia, aged 61, died May 25 of acute edema of the lungs.

Dr. Edwin Harrington Musson, Norborne, aged 65, died June 14 of coronary occlusion and myocardial fibrosis.

Dr. Frederick Charles Esselbruegge, St. Louis, aged 49, died May 22 following an operation for appendicitis.

Dr. Frederick B. Hall, St. Louis, aged 65, died June 26 of pneumonia.

NORTH CAROLINA

The Roaring Gap Children's Hospital, Roaring Gap, opened in June under the direction of Dr. Leroy J. Butler, Winston-Salem, for the 1934 season. Dr. J. W. Griffis is Resident Physician.

Dr. F. O. Fay has located at Wilmington and become associated with Dr. J. D. Freeman.

Dr. Amos N. Johnson, recently of Lincolnton, has returned to Garland, his former home, where he will practice medicine.

Dr. John Sasser McKee, Jr., Morgantown, and Miss Betty Ambler McGill were married June 30.

DEATHS

Dr. Berry Daniel Marshburn, Wendell, aged 80, died March 30.

Dr. Peter G. Pritchett, Timberlake, aged 87, died April 10 of myocarditis.

Dr. Jacob Carson Tilson, Marshall, aged 74, died June 15 of heart disease.

Continued on page 30

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DRYCO

Continued from page 28

Dr. Everett Augustin Lockett, Winston-Salem, aged 55, died suddenly June 26 of angina pectoris.

Dr. Charles Moore Strong, Charlotte, aged 72, died June 14 of heart disease.

OKLAHOMA

Dr. W. J. Trainor, Tulsa, is the newly elected Chairman of the City Board of Health.

Dr. F. Green Evans, formerly of Afton, has moved to Durant to practice medicine.

Deaths

Dr. Charles Lee Austin, Norman, aged 73, died May 5 in an Oklahoma City hospital of myocarditis following an operation for removal of the prostate.

Dr. Arthur C. Bell, Oklahoma City, aged 74, died suddenly May 13 of heart disease.

Dr. Samuel Sheldon Robinson, Tulsa, aged 74, died May 25.

SOUTH CAROLINA

Dr. John P. Thomas, Jr., formerly of Charleston, but now practicing in Gaffney, and Miss Thelma Elizabeth Fowler were married recently.

Deaths

Dr. Albert Theodore Russell, Barnwell, aged 53, died April 27 of nephritis and uremia.

Dr. Charles Carroll Geer, Greenville, Medical Corps, U. S. Army, retired, aged 63, died May 18 of cerebral hemorrhage and arteriosclerosis.

Dr. John Ramsey Dodenhoff, Springfield, aged 48, died June 7 of myocarditis and hypertension.

Dr. John Philip Ott, Columbia, aged 79, died April 29 of heart disease.

Dr. Dodson Ramseur Schenck, Greenville, aged 73, died June 7 of angina pectoris.

Dr. Edgar C. B. Mole, Hardeeville, aged 63, died June 9 of leukemia.

Dr. William Addy Oxner, New Brookland, aged 64, died March 22 of influenza and uremia.

TENNESSEE

Dr. Charles S. Paddock, Memphis, announces the opening of offices in the Medical Arts Building, with practice limited to urology and urologic surgery.

Deaths

Dr. James Leonidus Fields, Jackson, aged 46, died May 26 of carcinoma of the cecum.

Dr. Noah Danley, St. Joseph, aged 75, died May 6.

Dr. Benjamin Lee Jean, Dellrose, aged 62, died June 3.

Dr. Kince Manly Counce, Martin, aged 58, died April 22.

Dr. William Brownlow Spoon, Morristown, aged 69, died May 27 in an automobile accident.

Dr. William A. Miller, Bristol, aged 65, died May 4 of pneumonia.

Dr. J. H. Karsch, Memphis, aged 58, died suddenly June 14.

Dr. Dan German, Jr., Franklin, aged 25, died July 1 as the result of injuries received in an automobile accident.

TEXAS

Dr. John O. McReynolds, Dallas, the retiring President of the Pan-American Medical Association, is the recipient of the Venezuelan Medal of Honor, which was awarded him by the President of that Republic in recognition of his distinguished services to the cause of education.

The Bryan Hospital at Bryan has reopened in charge of the Catholic Sisters, and will be open to all physicians in Brazos and adjoining counties.

Gladewater has a new hospital which was opened during the summer.

Dr. Otis W. English and Dr. Fred W. Standefer, Lubbock, sailed in July for Vienna to take a five weeks' postgraduate course at the University of Vienna.

Dr. William G. Carnathan has moved from Conroe to Malakoff.

Dr. John H. Erwin formerly of High Rolls, New Mexico, has moved to Fort Bliss.

Dr. R. L. Futrell has moved from Westhoff to Cuero.

Dr. J. W. Hargus has moved from Asherton to Leming.

Dr. E. L. Hunt has moved from Fort Worth to Lubbock.

Dr. A. R. Jackson has moved from Conroe to Oklahoma City, Oklahoma.

Continued on page 32

An Endocrine Prescription in Dysmenorrhea and Amenorrhea

You can write an endocrine prescription in one word—a proper combination of the endocrine principles which are now known to initiate and control the menstrual process. Your prescription will have the advantage of being filled with fresh potent endocrine constituents. The formula is in accord with the most recent research on the endocrine glands concerned in regulating menstruation.

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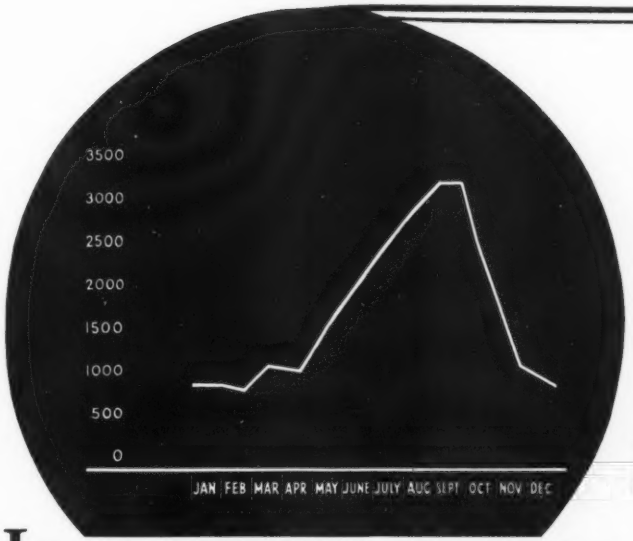

Summer Diarrhea

Mortality by months from diarrhea in infancy (under 2 years of age) for 1929 in United States Birth Registration Area. Figures from Bureau of Census Mortality Statistics.

IT IS STILL A FACTOR

To combat dehydration and to prevent destruction of body tissue associated with summer diarrhea, infants have immediate need for water, salts and carbohydrates.

In cases where vomiting is a symptom, withholding all fluids by mouth for a few hours may be advisable. In many cases it is best to withhold food from six to twenty-four hours. It is, however, necessary to give water during this period. Although babies bear temporary starvation they cannot get on without water.

In starting food, past experience by many physicians has shown the value of the following formula:—

Mellin's Food* . . 4 level tablespoonfuls
Water (boiled and cooled) 16 ounces

It is ofttimes desirable to add ¼ teaspoonful of sodium chloride to the mixture.

Individual conditions will guide the physician in prescribing the feedings. The usual custom is to give one to three ounces of the mixture every hour or two until the stools lessen in number and improve in character.

The mixture may then be slowly strengthened by the gradual substitution of boiled skimmed milk for the water in the formula until the quantity of skimmed milk is equal to the normal quantity of milk used in the baby's formula. Finally the fat of the milk may be cautiously added.

This suggested formula furnishes nutrition well suited to protect the proteins of the body, to prevent rapid loss of weight, to resist the activity of infectious bacteria and to assist in the retention of fluids and salts in the body tissues.

Mellin's Food Company, Boston, Mass.

*MELLIN'S FOOD: Produced by an infusion of Wheat Flour, Wheat Bran and Malted Barley admixed with Potassium Bicarbonate—consisting essentially of Maltose, Dextrins, Proteins and Mineral Salts.

Continued from page 30

Dr. R. L. Marrett has moved from El Paso to Hamlin.
Dr. Z. T. Martin has moved from Johnson City to Spicewood.
Dr. T. A. Moore has moved from Muleshoe to Eliasville.
Dr. J. C. Perry, formerly of Boston, Massachusetts, has located at Terrell.
Dr. F. T. McIntire has moved from Ozona to San Angelo.
Dr. Rufus A. Roberts has moved from Tulia to Plainview.
Dr. Robert C. L. Robertson has moved from Abilene to Snyder.
Dr. V. O. Rosser, Jr., has moved from Dallas to Graham.
Dr. Arthur M. Schorr, formerly of Chicago, has located at San Antonio.
Dr. R. W. Taylor has moved from Kerrville to San Antonio.
Dr. H. Wheeler, formerly of LaPryor, has moved to Kingman, Arizona.
Dr. J. L. Wright has moved from Colmesneil to Clarksville.
Dr. Hugo Auler and Miss Mary Blanton, both of Austin, were married June 12.
Dr. G. N. Wilson and Mrs. Louise Amiott, both of Vernon, were married June 16.

DEATHS

Dr. James Edward Pridgen, Thomaston, aged 62, died May 7 of myocarditis and pulmonary edema.
Dr. Finley D. Blackwell, Hochheim, aged 59, died May 28 of acute nephritis.
Dr. Willard Fiske, Lancaster, aged 83, died May 19 of cerebral hemorrhage.
Dr. John H. Reagan, San Antonio, aged 64, died suddenly June 22 of heart disease.
Dr. Joseph Montgomery Slaughter, Van Alstyne, aged 53, died May 10.

The "MESCO" Laboratories manufacture the largest line of Ointments in the world. Sixty different kinds. We are originators of the Professional Package. Specify "MESCO" when prescribing ointments. Send for lists.

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LOUISVILLE, KENTUCKY

Classified Advertisements

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ASSISTANCE OFFERED TO MEDICAL WRITERS. Research. Abstracts. Translations (all languages). Papers prepared from author's data. Ten years' experience with leading physicians and appointments on medical journals of highest standing. I employ no assistants; all my work is done personally and is reliable. Florence Annan Carpenter, 413 St. James Place, Chicago, Ill.

FOR SALE—Deceased doctor's office equipment, complete dispensary of drugs, x-ray laboratory suitable for small hospital. One of the best equipped offices in northern Oklahoma and the leading general practice in Perry, Oklahoma, a town of 5,000 population. A good opportunity for young doctor in the oil fields. Information upon request. Write L. S. Owen, Box 414, Perry, Oklahoma.

Dr. Frank D. Thompson, Fort Worth, aged 82, died May 18 of myocardial insufficiency, hypertension and diabetes mellitus.
Dr. John Lewis Adams, Comstock, aged 64, died April 30.
Dr. B. F. Clutter, Borger, aged 53, died April 27 in a hospital at Hines, Illinois.
Dr. Thomas Edward Standifer, Turkey, aged 71, died May 20 in an Oklahoma City sanitarium.
Dr. Robert W. Wallis, Rockdale, aged 60, died May 5.

VIRGINIA

The Virginia State Medical Association will hold its sixty-fifth annual meeting at Alexandria October 9-11.
The Amelia County Medical Society, at a recent meeting, elected the following officers for the coming year: Dr. J. M. Habel, Jetersville, President; and Dr. J. L. Hamner, Mannboro, Vice-President and Secretary-Treasurer.
Dr. Robert C. Bryan, Richmond, has recently been elected President of the American Association of Genito-Urinary Surgeons.
The Medical College of Virginia, Richmond, announces the addition to the faculty of Dr. Hans Kleinmann, lately of the University of Berlin, as Associate in Patho'ogy.
Dr. Lawrence T. Price has resigned as Professor of Clinical Genito-Urinary Surgery at the Medical College of Virginia, Richmond.
Dr. John A. M. Thompson has located at Sanatorium, and is connected with the State Board of Health at the Blue Ridge Sanatorium.
Dr. H. C. McCoy has located at Gordonsville for the practice of general medicine and is associated with Dr. W. C. Mason.
Dr. J. L. Kinzie has located at Salem to practice medicine.
Dr. George W. Booth has moved from Ferrum to Rocky Mount.
Dr. Llewellyn Powell, Alexandria, is the newly elected President of the Alexandria Tuberculosis Association, succeeding Dr. H. A. Latane.
Dr. E. L. McQuade, formerly Health Officer for Charlottesville, University and Albemarle County, was recently appointed Director of the State Department of Rural Health.
Dr. C. M. McCoy and Dr. P. B. Stokes have recently completed two and a half years' work in New York and Europe, and have opened an eye, ear, nose and throat hospital in Norfolk.
Dr. Malcolm D. Foster has located at Elkton after completing his internship at St. Luke's Hospital, Richmond.
Dr. L. P. Bailey has located at Nathalie for general practice after completing his internship at White Cross Hospital, Columbus, Ohio.
Dr. William Mayer Robinson, Richmond, and Miss Bluma Dolinsky were married May 27.
Dr. J. Gordon Rennie and Miss Anne Marie Lund, both of Petersburg, were married June 27.
Dr. Paige E. Thornhill, Norfolk, and Miss Marianne E. Avery were married June 16.
Dr. William J. Ellis, Covington, and Miss Bessie Virginia Winthrow were married June 8.
Dr. Andrew Muncy Groseclose, Roanoke, and Miss Mary Katherine McLaughlin were married July 5.
Dr. Charlie Frank Manges and Mrs. Susie Robinson Ware, both of Blacksburg, were married July 2.
Dr. John Marshall Winkfield, Strasburg, and Miss Mary G. Boland were married July 2.
Dr. Thomas C. Lawford and Miss Doris Louise Petty, both of Hilton Village, were married July 7.

DEATHS

Dr. William A. Johnston, Roanoke, aged 71, died May 30 of carcinoma of the stomach.
Dr. Montgomery Thomas McCulloch, Elkton, aged 54, died July 14 of drowning.
Dr. William Blount Barnham, Drewryville, aged 82, died April 24.

WEST VIRGINIA

The Wheeling Clinic at Wheeling observed the tenth anniversary of its founding in July with a special program planned for the occasion.
Dr. L. B. Todd has located at Quinwood for the practice of medicine.
Dr. Robert Hough Jordan, Beckley, and Miss Mary Edith Faulkner were married June 30.

DEATHS

Dr. Edgar William Guilford, Newell, aged 60, died May 2 of cerebral hemorrhage.
Dr. Ernest R. McIntosh, Weston, aged 59, died June 2 of carcinoma of the bladder.

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The cereal-starch of PABLUM is more quickly digested than that of long-cooked cereals

FOR many years it has been the custom to cook infants' cereals one, two, and even three hours to increase their digestibility. The microscope (and clinical tests*) now prove that this bothersome and expensive long cooking is unnecessary with Pablum. For, being pre-cooked at 10 pounds steam pressure and dried, it is so well cooked that it can be served simply by adding water or milk of any temperature. Photomicrographs and also digestibility studies *in vitro* give evidence of this thorough cooking.

Fifteen cereals (both cooked and uncooked) studied microscopically were revealed as containing many starch granules, most of them massed into dense clumps. *Such unruptured clumps were never observed in hundreds of examinations of Pablum.* The latter consists, rather, of porous flakes which, like sponges, drink up liquids. Hence Pablum can be entirely saturated by the digestive secretions. This is borne out by studies of Ross and Burrill who found that the starch of Pablum is more rapidly digested than that of ordinary cereals cooked 4 hours.

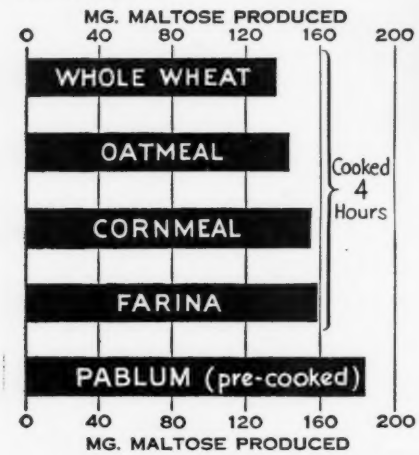
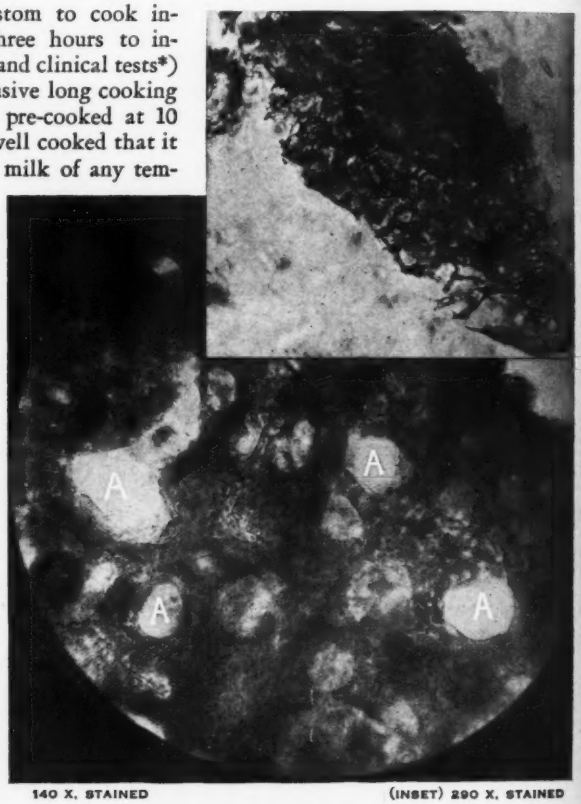


***Chart shows that maltose production is much greater for Pablum prepared with cold water than for other cereals cooked 4 hours. Ross and Burrill (Journal of Pediatrics, May 1934) conclude from this and from the total soluble carbohydrate formed that starch digestion of Pablum is more rapid than that of 6 other cereals.**



140 X. STAINED (INSET) 290 X. STAINED

Large photomicrograph: **Pablum mixed with cold water—portion of large flake. Pablum flakes are honeycombed with "pores" or air-spaces (note light areas A). This porosity permits ready absorption of digestive fluids by the entire flake. No starch granules are visible—they have been completely ruptured.**

Inset: **Farina cooked ½ hour—clump of cereal composed of unruptured starch granules. Note density of clump and lack of porosity. Many starch granules, such as are present in raw cereal, remain unchanged in form.**

BESIDES being thoroughly cooked and readily digestible, Pablum supplies essential vitamins and minerals, especially vitamins A, B, E, and G, and calcium, phosphorus, iron, and copper. It is a palatable cereal consisting of wheatmeal, oatmeal, cornmeal, wheat embryo, alfalfa leaf, beef bone, brewers' yeast, and salt.

**Reprint of Ross and Burrill paper sent on request of physicians.*

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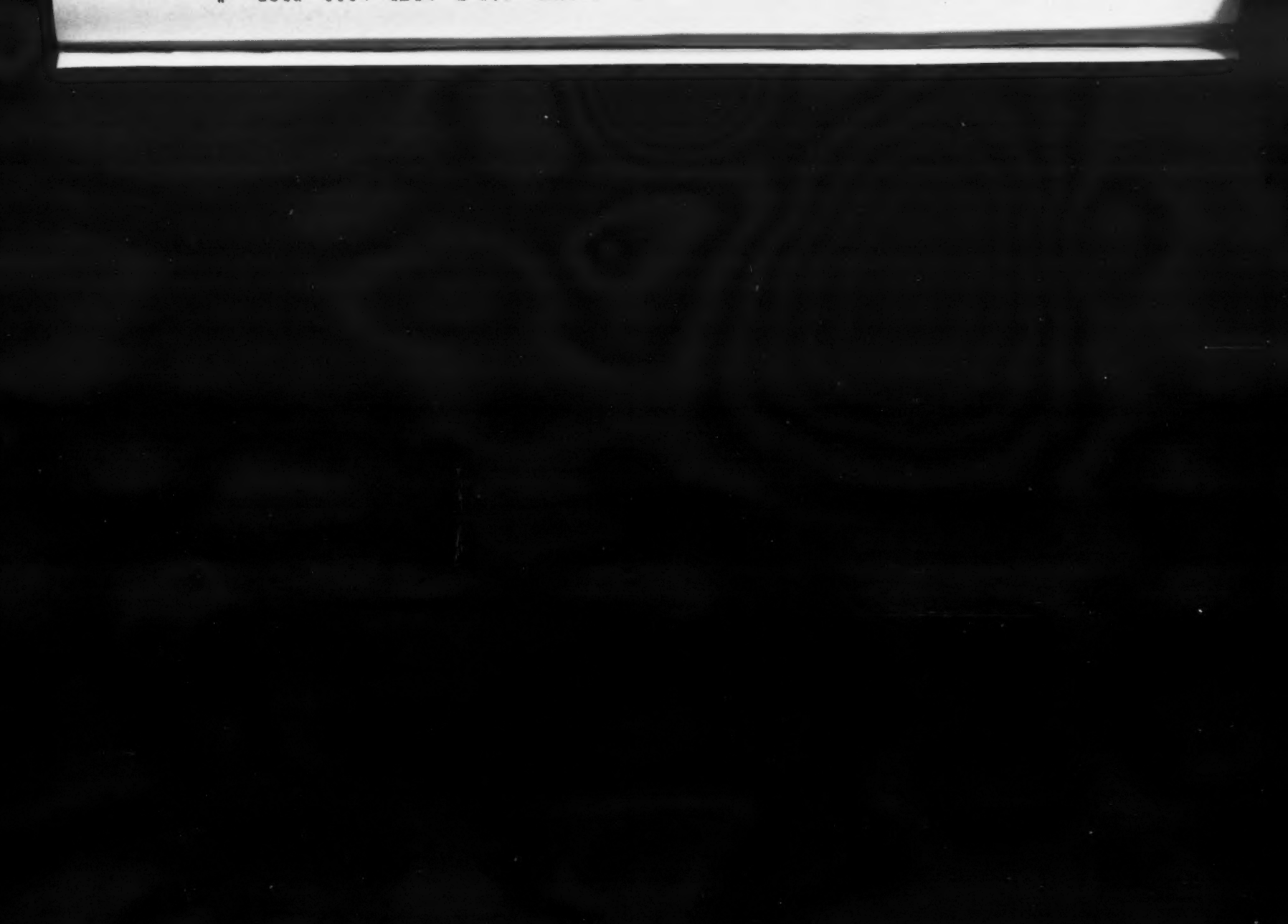

for sick as well as normal babies
Dextri-Maltose, Carbohydrate of Choice

In gastrointestinal disorders, "Dextri-maltose has been preferred to the other sugars as apparently less irritating."—*E. Cassie and U. Cox: The examination of the gastric contents in infants, with some considerations as to the value of lactic acid milk in infant feeding, Lancet, 2:322-325, August 14, 1926.*

"As to the kind of extra carbohydrate to be added, whether lactose or maltose, I believe dextri-maltose to be better in general in cases of fat indigestion (infantile atrophy)."—*C. H. Dunn: The Hygienic and Medical Treatment of Children, Southworth Co., Troy, New York, 1917, V. 1, p. 418.*

In the treatment of decomposition, "The period of repair may be shortened by giving suitable additional food; the best, probably, being buttermilk to which carefully regulated proportions of dextrin and maltose preparations or malt soup are added."—*E. Feer: Text-Book of Pediatrics, J. B. Lippincott Co., Phila., 1922, p. 284.*

In infantile atrophy, "The carbohydrate should be increased by gradual addition of dextrimaltose.

"Malt soup or dextrimaltose (Mead's) should be added in teaspoonful or more doses to each feeding until the point of carbohydrate tolerance is reached."—*L. Fischer: Diseases of Infancy and Childhood, F. A. Davis Co., Phila., 1925, V. 1, p. 285.*

In the case of a premature infant, "Dried milk with water was given, which later was changed to whole milk, 14 ounces; water, seven ounces, and dextri-maltose No. 1, one and one-half ounces. Seven feedings of three ounces each every three hours was given. The above feeding was retained. The infant gained eight ounces at the end of the first week."—*L. Fischer: Clinical notes in a series of premature infants, Arch. Pediat. 44:227-231, April, 1927.*

In the treatment of decomposition, "As a rule it is best to start with 2 to 2½ or 3 ounces of albumin milk to the pound weight in 24 hours; the sugar to be added is in the form of a maltose-dextrin mixture. One should never delay too long in adding this."—*C. G. Grulee: Infant Feeding, W. B. Saunders Co., Phila., 1922, p. 265.*

With reference to hypotrophy, "In mild cases, the addition of dextrimaltose instead of cane or milk sugar may be sufficient to obtain a gain in weight."—*C. Herrman: The treatment of nutritional disorders in artificially-fed infants, New York M. J. 114:158-160, August, 1921.*

In athrepsia, "The carbohydrates are usually added in a slowly fermentable form, such as the maltose and dextrin compounds, which are usually started by the addition of four grams per kilogram (1/15 ounce per pound) and increased until eight grams or more per kilogram (¼ ounce per pound) of body weight are added."—*J. H. Hess: Feeding and the Nutritional Disorders in Infancy and Childhood, F. A. Davis Co., Phila., 1928, p. 278.*

Concerning the treatment of marasmus, "When the stools have become smooth and salve-like, carbohydrate, in the form of dextrimaltose, may be gradually added up to the limit of tolerance."—*L. W. Hill: Practical Infant Feeding, W. B. Saunders Co., Phila., 1922, p. 281.*

In the feeding of prematures, "As soon as there is a hesitation in the gain in weight, dextrimaltose No. 1 is substituted for the dextrose, in the same amount in the mixture, with almost invariably a gain in weight."—*F. B. Jacobs: Relation of irradiated food substances and ergosterol versus cod liver oil in childhood nutrition, Pennsylvania M. J. 35:164-167, Dec., 1931.*

"A spasmophilic baby on bottle feeding should receive a limited amount of milk—a pint, or at the most 24 ounces in the 24 hours—to which cereal gruel and some form of sugar is added, preferably one of the malt dextrin preparations; also the early addition of other foods than milk to the baby's diet."—*M. Jampolis: Infantile spasmophilia, Interstate M. J. 25:652, Sept., 1918; abst. Arch. Pediat. 35:691, Nov., 1918.*

In cases of malnutrition and indigestion, "The appetite improves rapidly, and the stools soon become normal in appearance, if the sugars are intelligently prescribed. By this I refer to proper proportions of dextrin and maltose. When there is a tendency to looseness, I have used the preparation known as 'dextri-maltose,' for the extra carbohydrates; . . ."—*M. Ladd: Further experience with homogenized olive oil mixtures, Arch. Pediat., 33:501-512, July, 1916.*

In pyloric stenosis, "With low dextrose tolerance, a maltose dextrin preparation may be added in whole or in part. Even where the dextrose is well tolerated and gain in weight has ceased, impetus to the weight ontake may be given by the addition of a maltose dextrin preparation."—*D. J. Levy: Pyloric stenosis and pylorospasm of infancy with especial reference to medical treatment, J. Michigan St. M. S., 21:166-170, April, 1922.*

With reference to the treatment of diarrhea, "After several days, 2% to 3% of a maltose-dextrin preparation may be added (Dextri-Maltose). This is preferable to the easily fermentable lactose or cane sugar."—*F. Lust: The Treatment of Children's Diseases, J. B. Lippincott Co., Phila., 1930, p. 145.*

In dyspepsia, "The carbohydrate must not be allowed to exceed 3 per cent. Dextri-maltose is the most suitable sugar."

In the treatment of decomposition (atrophy, malnutrition, marasmus), ". . . when there has been obvious improvement, dextri-maltose is gradually increased from 3 to 5 per cent."—*B. Myers: The nutritional disturbances of infancy, Brit. M. J., 1:1079-1083, June 21, 1924.*

"The treatment of artificially fed children in the first of these groups consists in putting them on a low fat dietary, and giving them carbohydrate in the form of one of the less fermentable sugars—e.g., dextrimaltose."—*L. G. Parsons: Wasting disorders of early infancy, Lancet, 1:687-694, April 5, 1924.*

In the milder cases of inanition, "Regulation of this disturbed organismal balance is obtained by the addition of carbohydrates, while fat and casein are reduced. For this purpose dextrimaltose and flour are better than the ordinary sugars, since they are more slowly absorbed and have greater efficacy in their powers of controlling the flora in the large intestine."—*W. J. Pearson and W. G. Wyllie: Recent Advances in Diseases of Children, P. Blakiston's Son & Co., Phila., 1930, p. 116.*

In intestinal intoxication, "I have had more experience with dried skimmed milk in which 2 to 5 per cent dextrimaltose, barley or rice flour has been cooked, and the mixture subsequently fermented by lactic acid bacilli or soured with lactic acid, than with any other food except protein milk."—*G. F. Powers: A comprehensive plan of treatment for the so-called intestinal intoxication of infants, Am. J. Dis. Child., 32:232-257, August, 1926.*

Regarding the treatment of the marantic infant, "After the intolerance to sugar has been overcome a carbohydrate, preferably Dextri-maltose, may be added."—*C. S. Raue: Diseases of Children, Boericke & Tafel, Phila., 1922, p. 427.*

In spasmophilia, "Dextri maltose is the best sugar to use in these cases, in the proportion of 6 to 8 per cent."—*J. H. Reading, Jr.: Spasmophilia, Hahneman. Monthly, pp. 403-411, July, 1922.*

In the treatment of atrophy, "If the baby continues to improve, the next step in the treatment is to add to the milk one of the less fermentable carbohydrates, such as dextrimaltose; . . ."—*H. Thursfield and D. Paterson: Diseases of Children, William Wood & Co., 1929, p. 105.*

"I also find dextrin-maltose an excellent addition to albumin-milk when the first object of that food has been achieved and a gain in weight is desired; in this way I have succeeded in feeding albumin-milk far beyond the period usually advised, with highly gratifying results."—*F. L. Wachenheim: Infant-Feeding; Its Principles and Practice, Lea & Febiger, Phila., 1915, p. 158.*

"Dextri-maltose has been substituted for lactose not infrequently, when the tolerance for the latter continues low."—*J. H. West: Low fat, high starch evaporated milk feeding for the marasmic baby, Arch. Pediat. 48:189-193, March, 1931.*

"Malt sugar is indicated when others fail to produce a sufficient gain, or when malassimilation of fat is evident."—*O. H. Wilson: The role of carbohydrates in infant feeding, Southern M. J. 11:177, March, 1918; abst. Arch. Pediat. 35:447, July, 1918.*

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